The required return on equity: Response to ATCO Gas Australia Draft Decision, Stephen Gray, SFG Consulting November 2014

Appendix 9.1

27 November 2014

Response to the ERA's Draft Decision on required amendments to the Access Arrangement for the Mid-West and South-West Gas Distribution System

Connecting WA to natural gas

The required return on equity: Response to ATCO Gas Draft Decision

Report for ATCO Gas Australia

24 November 2014

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Overview and instructions

1. SFG Consulting (**SFG**) has been retained by ATCO Gas Australia (**ATCO**) to provide our views on issues relating to the estimation of the required return on equity for the benchmark efficient entity. In particular, we have been asked to respond to the ATCO Gas Draft Decision of the Economic Regulation Authority of Western Australia (**ERA**) insofar as it relates to the required return on equity.

Preparation of this report

2. This report has been authored by Professor Stephen Gray, Professor of Finance at the UQ Business School, University of Queensland and Director of SFG Consulting, a specialist corporate finance consultancy. I have Honours degrees in Commerce and Law from the University of Queensland and a PhD in financial economics from Stanford University. I teach graduate level courses with a focus on cost of capital issues, I have published widely in high-level academic journals, and I have more than 15 years' experience advising regulators, government agencies and regulated businesses on cost of capital issues.

3. My opinions set out in this report are based on the specialist knowledge acquired from my training and experience set out above.

4. I have read, understood and complied with the Federal Court of Australia Practice Note CM7 *Expert Witnesses in Proceedings in the Federal Court of Australia.*

5. A copy of my curriculum vitae and my instructions are attached as appendices to this report.

Summary of conclusions

Implications of the Draft Decision

6. The ATCO Gas Draft Decision proposes to reduce the allowed return on equity by 35% relative to the current access arrangement. There are two components of this reduction:

   a) The risk-free rate has been reduced by 47% – from 5.61% to 2.95%; and

   b) The premium for risk has been reduced by 20% – from 4.80% to 3.85%.

7. That is, the ERA has compounded the material reduction in its estimate of the risk-free rate with a material reduction in its estimate of the premium for risk.

8. As part of its work for the Rate of Return Guideline, the ERA undertook a substantial statistical analysis of the stationarity of (a) the required return on equity and (b) the market risk premium. The ERA concluded that the overall required return on equity was stationary and that the market risk premium was not. Thus, when the risk-free rate falls the MRP tends to rise, and vice versa. This results in the MRP varying in the opposite direction to the risk-free rate such that the overall required return on equity is relatively stationary. In its ATCO Gas Draft Decision, the ERA confirms that:

> consistent with the evidence, the Authority's view is that the return on equity is more stable than the MRP, over the longer term. [1]

[1] ERA ATCO Gas Draft Decision, p. 163, Paragraph 712.

9. However, the ATCO Gas Draft Decision proposes a dramatic change in the estimate of the required return on equity. Part of this is due to a reduction in the ERA's estimate of the risk-free rate, but that is compounded by a material decrease in the ERA's estimate of the premium for risk. Rather than the risk premium serving to offset some of the change in the risk-free rate (such that the return on equity is more stable), the ATCO Gas Draft Decision adds to the decrease in the risk-free rate by a further material decrease in the risk premium

Errors in the ERA's estimate of the allowed return on equity

10. In our view, a series of errors have led the ERA to its conclusion that the allowed return on equity should be decreased by 35% via compounding material reductions in its estimates of the risk-free rate and the premium for risk;

    a) **Equity beta**: As set out in Section 2 of this report, our view is that the ERA has erred in its reliance on a set of domestic comparators that is too small to produce reliable results. In our view, international comparators are relevant evidence and the ERA has erred in disregarding that evidence.

    b) **Market risk premium**: As set out in Section 3 of this report, our view is that the ERA has erred in its estimation of the market risk premium in the following respects:

        i) The ERA has not properly analysed the evidence that it has regard to. For example, the ERA uses stale historical returns data that has not been amended for inaccuracies that have been identified in it or for the ERA's material change in its estimate of the value of imputation credits. Another example is that the ERA has incorrectly interpreted dividend discount analyses as providing a direct estimate of the MRP rather than of the required return on the market; and

        ii) The ERA has disregarded relevant evidence. For example, the ERA states that it will use the Wright approach to inform its estimate of MRP, but then does not do so.

    c) **Risk-free rate**: As set out in Section 4 of this report, our view is that the ERA has erred in adopting a five-year term for the risk-free rate. The five-year term is based on the ERA's "present value principle." However, the very derivation of the present value principle shows that it is only consistent with a five-year term if the end-of-period market value of the asset is known with certainty from the outset. Since it is not, a longer term should be used, consistent with the dominant commercial and regulatory practice.

    d) **Consideration of other relevant models**: As set out in Section 5 of this report, our view is that the ERA has erred in disregarding all models other than the Sharpe-Lintner CAPM for the purposes of estimating the required return on equity. In our view, other models do provide relevant evidence and proper consideration of them would have illuminated the extreme outcome that the ERA has arrived at from its mechanistic implementation of a single model.

11. In our view, these errors all compound one another and all of them lead to the allowed return on equity being smaller than it would have been in the absence of those errors.

Rationale for correcting errors

12. The AEMC has explicitly stated that achieving the National Gas Objective (NGO) and Revenue and Pricing Principles (RPP) requires the best estimate possible in the circumstances of the benchmark efficient financing costs, an important component of which is the required return on equity:

> Achieving the NEO, the NGO, and the RPP requires the best possible estimate of the benchmark efficient financing costs. The Commission stated that this can only be achieved when the estimation process is of the highest possible quality. The draft rule determination stated that this meant that a range of estimation methods, financial models, market data and other evidence must be considered.[2]

and that, in this regard, the AEMC has amended the Rules to require that:

> In determining the *allowed rate of return*, regard must be had to relevant estimation methods, financial models, market data and other evidence.[3]

13. For the reasons set out above, our view is that the ERA's current estimate of the allowed return on equity is not the best possible estimate. It then follows that the ERA has not produced "the best possible estimate of the benchmark efficient financing costs" as required by the AEMC above and in the Allowed Rate of Return Objective. It also follows, as set out by the AEMC above, that the ERA's allowed return will not achieve the NGO or RPP. Specifically, a key part of the NGO is to:

> promote efficient investment in…natural gas services…for the long term interests of consumers.[4]

14. An allowed return on equity that is materially below the efficient financing costs of the benchmark efficient entity will create incentives for under investment, which is not in the long-term interests of consumers.

15. Similarly, the RPP require that:

> regard should be had to the economic costs and risks of the potential for under and over investment, [5]

and that:

> a reference tariff should allow for a return commensurate with the regulatory and commercial risks involved.[6]

16. These principles cannot be complied with if the allowed return does not reflect the best estimate possible in the circumstances of the efficient financing costs of the benchmark efficient entity.

17. The RPP also require that:

[2] AEMC Rule Change Final Determination, p. 43.
[3] National Gas Rules, clause 87(5).
[4] National Gas Law, s. 23.
[5] National Gas Law, s. 24(6).
[6] National Gas Law, s. 24(5).

> a service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs,[7]

which would seem to require that the allowed return must be at least commensurate with the efficient financing costs of the benchmark efficient entity.

Conclusions

18. For all of the reasons set out above, our view is that:
    a) The Draft Decision should be varied so that the Final Decision corrects each of the errors we have identified in this report; and

    b) Doing so will, or will be likely to, result in a decision which is materially preferable to the Draft Decision in making a contribution to the NGO as regards the estimation and quantum of the cost of equity.

19. In forming these views we have taken into account the constituent components of the cost of equity and how they interrelate with each other, the RPPs, and the Draft Decision as a whole as it relates to the cost of equity, together with each of the other relevant considerations raised through-out this report.

[7] National Gas Law, s. 24(2).

2. Equity beta

Practical effect of the ATCO Gas Draft Decision

20. In its ATCO Gas Draft Decision, the ERA has determined that the systematic risk of the ATCO distribution network has fallen by 12.5% over the last five years (from 0.8 to 0.7). Accordingly, the equity risk premium available to ATCO's shareholders will be reduced by 12.5% (prior to the further reduction caused by the ERA's reduction in the market risk premium). These are highly material changes, yet the ERA has not explained what has led to ATCO becoming materially less risky over the past few years. ATCO's business operations have not changed, its financial and operating leverage has not changed, its credit rating has not changed – it is same business as it was five years ago. Since the drivers of ATCO's systematic risk have not changed, there is no explanation for any change in its beta.[8]

21. The ERA appears to have reduced the equity beta estimate based purely on its recent statistical analysis. We address what we believe to be the shortcomings of that statistical analysis in some detail below. At this point we note that the outcomes of the statistical analysis (a 12.5% reduction) cannot be reconciled with any explanation of why the systematic risk of ATCO might have fallen so dramatically. In our view, it would be an error to mechanistically adopt a materially different beta estimate, on the basis of a statistical analysis, without any consideration of whether there is any logical explanation that is consistent with such a material change in risk.

Key point of difference

22. We have made a number of previous submissions on equity beta to the ERA.[9] In its ATCO Gas Draft Decision, the ERA sets out its current views on equity beta and provides its current estimate of 0.7. The key point of difference between our submissions and the position adopted by the ERA concerns the set of comparator firms. In particular:

    a) The ERA is of the view that the very small set of domestic comparators is able, by itself, to produce a reliable estimate of equity beta; whereas

    b) Our view is that the set of domestic comparators is too small to be able to produce a reliable estimate of equity beta by itself. Consequently we recommend that some regard should be had to international comparators.

23. The ERA concludes that, the very small set of domestic comparators (there are currently four firms in the set) supports an equity beta estimate of 0.7. We do not suggest that the ERA has made any calculation or other errors in performing its regression analyses. Our point is that the tiny set of domestic comparators is incapable, however thoroughly it might be analysed, of producing a reliable equity beta estimate. Our previous submission[10] set out the reasons that led us to this conclusion. In the remainder of this section, we summarise those reasons and our response to the ERA's consideration of them in the ATCO Gas Draft Decision.

Imprecision in beta estimates

24. In its ATCO Gas Draft Decision, the ERA recognises that its beta estimates suffer from a high level of imprecision:

[8] We note that beta is independent of changes in the estimate of the market risk premium over time. Beta measures the risk of the firm *relative* to the average firm, whereas MRP measures the absolute *level* of risk of the average firm.
[9] See, for example, SFG (2014 ERA).
[10] SFG (2014 ERA).

> the Authority also acknowledged that a high level of imprecision existed for any empirically estimated value of the equity beta. The Authority considered that issues of imprecision are best addressed via the use of multiple models and statistical techniques to inform a possible range for any equity beta estimate.[11]

25. In our previous report,[12] we noted that the ERA's equity beta estimates are imprecise. For example, the confidence interval for HDF runs from 0.59 to 1.80, the confidence intervals for DUE and SPN include negative estimates, and the confidence interval for SKI runs from 0.19 to 0.90.[13] These confidence intervals are so wide as to render the mid-point estimates essentially useless. Whereas the ERA's portfolio beta estimates are less imprecise, the portfolio estimates are all affected by the range of statistical problems set out below. In particular, the portfolio data is simply the sum of the data for the small number of individual firms. To the extent that the problems set out below would result in a lack of confidence in the individual firm estimates, they would also affect the confidence that would be placed in the estimates from a portfolio of a small number of firms.

26. The ERA's proposed solution to the imprecision in its beta estimates is to collect what it considers to be the relevant data and to process that data with a number of different variations of regression analysis. In our view, the problem lies in the fact that the ERA relies on a data set that is so small that it is simply incapable of producing reliable estimates. Analysing the same data over and over again with slight variations in the form of regression analysis does nothing to address the problem of inadequate data. The ERA now has a sample of four listed firms. No matter how closely we look at them, such a small sample is simply incapable of producing reliable results. We need more than four data points. Looking ever more closely at each of the four does nothing to address the underlying problem.

27. This repeated analysis of the same data is a particular issue for the ERA's portfolio estimates. Estimates that use different ways of forming portfolios of the same firms, or which apply different variations of regression analysis, should not be thought of as producing independent outcomes that serve to corroborate one another. They are simply means of regenerating essentially the same outputs from the same (inadequate) source data.

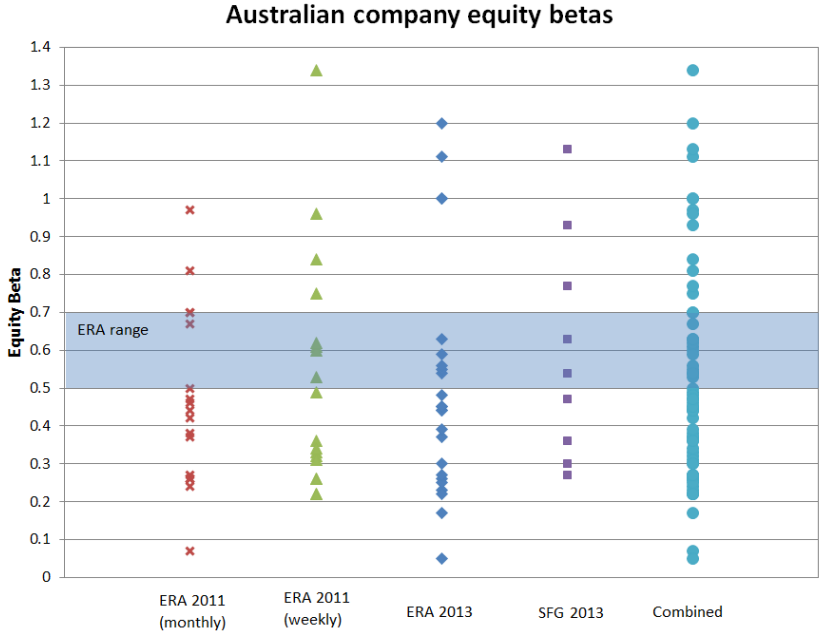
28. The only way to improve reliability is to increase the number of firms that are analysed. A larger sample of firms will improve the statistical reliability of the estimates. More and more re-examination of the same few firms is no substitute for having an appropriate sample size.

Selection of the range of 0.5 to 0.7

29. Our previous report[14] summarised the domestic equity beta estimates on which the ERA relies in the figure that is reproduced below.

[11] ERA ATCO Gas Draft Decision, p. 170, Paragraph 741.
[12] SFG (2014 ERA)
[13] ERA Rate of Return Guideline Explanatory Statement, Table 26, p. 174.
[14] SFG (2014 ERA).

Figure 1. Regression-based estimates of Australian-listed energy networks



Source: ERA (2011),[15] ERA (2013),[16] SFG (2013 Beta).

30. We stated that:

> The ERA has provided no basis for why it has constrained the range to 0.5-0.7, nor even explained what the range means. It is not a confidence interval, it is not the minimum-to-maximum, it appears to be an arbitrarily selected band. But the selection of this range is very important because the final value of equity beta is constrained to come from within this range – regardless of any other relevant to the contrary.[17]

31. In its ATCO Gas Draft Decision, the ERA provides some explanation about how it has computed the range of 0.5 to 0.7 for beta. First, the ERA confirms that its range does not represent a statistical confidence interval:

> the 95 per cent confidence interval using the bootstrapping procedure falls within the range of 0.3 to 0.72[18]

32. The ERA's range also does not represent its minimum and maximum point estimates.

33. Rather, it appears that the range has been determined by:

    a) The ERA's point estimate from domestic comparators:

> the 0.5 figure is consistent with the Authority's equally-weighted portfolio average estimate (0.50), the average value-weighted portfolio estimate (0.49) and the average of the individual firm estimate (0.52). [19]

[15] Economic Regulation Authority, 2011, Western Power access arrangement: Draft Decision, March.
[16] Economic Regulation Authority, 2013, Draft Rate of Return Guidelines for Gas Transmission and Distribution Networks – Explanatory Statement, August.
[17] SFG (2014 ERA), Paragraph 369.
[18] ERA ATCO Gas Draft Decision, p. 170, Paragraph 741.

b) And one end of the 95% confidence interval from the ERA's bootstrap analysis.

34. However, this explanation raises a number of additional issues:

a) A range that combines a point estimate at one end with a statistical upper bound at the other cannot be sensibly interpreted. A similar issue has been dealt with in the *Gamma Case*, where the Tribunal ruled that the AER had erred in proposing to average an upper bound estimate with a point estimate. The Tribunal described that point as follows:

> the AER averaged 'apples and oranges'; that is, the AER was in error to average an upper bound for theta derived from a tax statistics study with a point estimate provided by a dividend drop-off study.[20]

In this case the ERA does not seek to *average* a point estimate with an upper bound, but to *combine* a point estimate for one end of its range and an upper bound for the other. In our view, this is inconsistent and produces a range that has no meaningful interpretation; and

b) Table 40, Appendix 25, (p. 180) of the ERA Guideline reports an average 95% bootstrap confidence interval of 0.307 to 0.760. That is, the upper bound, even from the ERA's own analysis of its domestic comparators is closer to 0.8 than 0.7.

35. The ERA's 0.5 to 0.7 range does not usefully represent anything other than that it appears the ERA relies on it to conclude that any estimate from outside the range must be rejected as unreasonable. In our view, this cannot be reconciled with the fact that the vast majority of the ERA's beta estimates (and their confidence intervals) lie outside the specified range.

Instability of equity beta estimates

36. In our previous report,[21] we demonstrated that the ERA's equity beta estimates varied widely across methodological choices and over time.

37. In relation to the variation across methodological choices we provided the following example for HDF. The estimates set out in the table below are for the same company for the same time period, but they vary dramatically.

Table 1
Regression-based beta estimates for HDF from ERA (2011)

		Regression Method	
		OLS	**LAD**
Sampling	Monthly	0.07	0.47
Period	Weekly	1.34	0.84

38. In relation to the variation across time, we noted that:

> According to the ERA estimates, the average estimate of beta for Envestra increased by 20% between 2011 and 2013. There are two explanations for this:

[19] ERA ATCO Gas Draft Decision, p. 170, Paragraph 744.
[20] Application by Energex Limited (No 2) [2010] ACompT 7, Paragraph 83.
[21] SFG (2014 ERA)

> (a) The true systematic risk of Envestra did actually increase by 20% over a two-year period; or
>
> (b) The beta *estimates* are unreliable.
>
> Moreover, the results also imply that, over the same two year period, the average estimate of beta for Enevstra *increased* by nearly 20% and the beta of DUE *decreased* by 25%. Moreover, of the six firms examined by the ERA in 2013, three had *higher* beta estimates and three had *lower* beta estimates relative to the ERA's estimates two years earlier. Again, there are two possible explanations:
>
> (a) The true systematic risk of some of the benchmark firms increased materially over the two-year period and the true systematic risk for others decreased materially (which would call into question whether these firms are all properly included in the same set of "comparables"); or
>
> (b) The beta *estimates* are unreliable.[22]

39. Our point here is that it is implausible that over a two-year period the *true* equity beta of one comparator would increase by as much as 20% at the same time as the *true* equity beta of another comparator fell by 25%. When there are no material changes to the structure or operations of a firm, its true systematic risk is unlikely to change materially over such a short period. Our point is that the ERA's beta *estimates* suggest implausible variation in the systematic risk of these firms. Because the variation in the ERA's beta estimates does not plausibly reflect the variation in the true systematic risk of the comparator firms, it is unlikely that the ERA's estimates would reliably reflect the *level* of systematic risk in the comparator firms.

40. Indeed as a matter of basic logic, it must be the case that either:

    a) The ERA's beta estimates do not reliably reflect the true systematic risk of the comparator firms (as we suggest above); or

    b) The set of comparator firms is mis-specified – it cannot be the case that the benchmark firm was simultaneously comparable to one firm whose systematic risk *rose* by 20% over a two-year period *and* with another firm whose systematic risk *fell* by 25% over the same two-year period.

41. The ATCO Gas Draft Decision misunderstands the point being made here. The ERA notes that its beta estimates vary considerably over time and concludes that it will solve this problem by using the most recent estimates that are available at the time of each decision:

> The Authority notes that the beta parameter shows variation through time, regression procedures and across firms. As a consequence, the Authority intends to re-estimate the value for equity beta at the beginning of new access arrangements to incorporate the most relevant information for its decision. [23]

42. This response misses the point entirely. As set out above, our point is that the dramatic and inconsistent time series variation in the ERA's beta estimates indicates that they provide an unreliable

[22] SFG (2014 ERA), Paragraphs 374-375.
[23] ERA ATCO Gas Draft Decision, p. 170, Paragraph 741.

basis for quantifying the true systematic risk of the benchmark firm. That is, our point is about reliability, not timeliness. The most recent unreliable estimate is still an unreliable estimate.[24]

43. On a related point, the ERA states that:

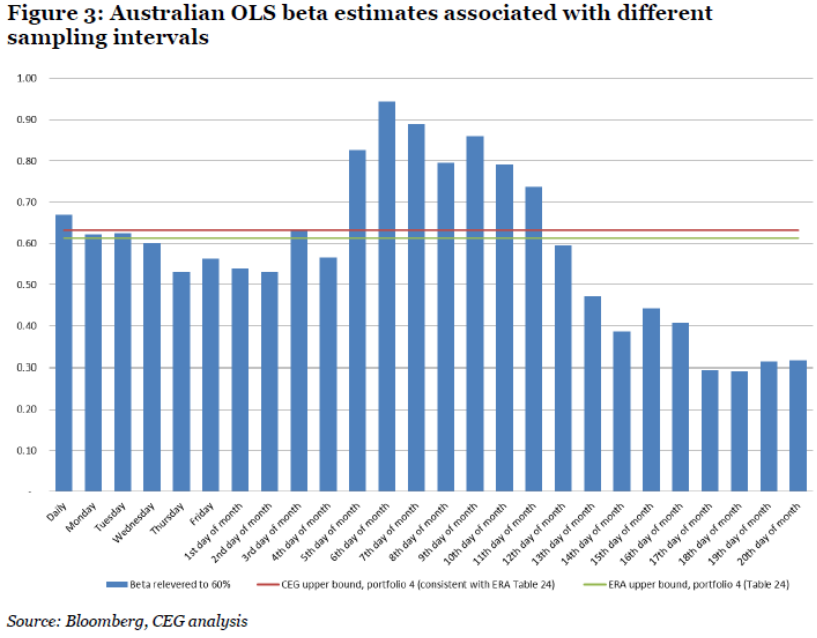
> With respect to the varying estimates of Hastings Diversified Fund, DUET and Envestra quoted by SFG, the Authority produced recursive beta estimates of the individual firm betas in the Rate of Return Guidelines, highlighting this issue. Again, this fact is omitted from SFG's submission. [25]

44. This response also misses the point. The ERA makes the point here that they are well aware of the tremendous time series instability in their beta estimates, and we accept that. However, our point here is not that the ERA is unaware of this instability, but rather that it has done nothing about it.

Variation by sampling day

45. In our previous report,[26] we also demonstrated that the ERA's equity beta estimates varied materially depending on which day of the week or month was used to define the return interval. The ERA relies exclusively on regressions based on weekly returns measured from Friday-to-Friday. Had the ERA performed exactly the same analysis using returns measured from Tuesday-to-Tuesday the mean beta estimate would have been approximately 20% higher. Using the ERA's estimation process, the average beta estimate based on monthly returns varies by a factor of three depending on which day of the month is used to define the return interval. This wide variation in mean beta estimates is summarised in Figure 2 below.

Figure 2. Australian OLS beta estimates associated with different sampling intervals



Source: CEG (2013), Figure 3.2, p. 26.

46. In our view, this wide variation in returns – caused by nothing more than changing the day of the week (or month) from which returns are measured – demonstrates unreliability. There is no

[24] By way of analogy, our point is that rolling dice produces random numbers that will not tell you anything about who will win the Melbourne Cup. The ERA's response is that it will be sure to look at the very latest dice rolls before it places a bet.
[25] ERA ATCO Gas Draft Decision, p. 171, Paragraph 748.
[26] SFG (2014 ERA).

conceptual or statistical reason to prefer returns to be based on any particular reference day – all reference days are equally valid.

47. The unreliability of the ERA's beta estimate lies in the fact that the ERA's sample is so small that random variation in beta estimates as we move from one reference day to another does not cancel out. In a larger sample (such as would be available if the ERA were to have regard to US comparators) this random variation tends to cancel such that the overall estimate is more stable and therefore more reliable.

48. The ERA's response to this issue in its ATCO Gas Draft Decision is as follows:

> the use of Friday to Friday returns was suggested by Henry and commonplace throughout the academic literature. Therefore, the Authority rejects SFG's contention that the wide variation in returns caused by changing how the returns are calculated is evidence of instability in the beta estimate. [27]

49. That is, the ERA does not dispute the evidence that its tiny small sample of domestic comparators produces materially different beta estimates depending on which day of the week happens to be used to define the return interval. However, the ERA concludes that this is not evidence of instability in the beta estimate. In our view, uncontested evidence that shows that the beta estimate varies materially across days of the week clearly *is* evidence that the beta estimate is unstable across days of the week. In our view, no other conclusion is possible.

50. The ERA's contention that some other authors have used Friday-to-Friday returns is of little relevance. This makes no material difference, and any event the real problem is the instability in the data, not the choice of day on which data are observed. As noted above, there is no conceptual or statistical reason to prefer one day of the week to any other. Consequently, there is no uniform standard day of the week that is generally used in the literature. Moreover, published studies containing equity beta estimates employ samples that are orders of magnitude larger than the ERA's sample of domestic comparators – published studies do not investigate samples of four listed firms (plus two that used to be listed). In a reasonably sized sample, there will be little variation in the overall estimate by day of the week as random variation tends to cancel in larger samples. Consequently, the choice of day of the week is of little moment for larger samples.[28] The instability across days of the week only arises here because the ERA's sample is so small.

51. The ERA's claim that Henry (consultant for the AER) uses Friday-to-Friday returns is not entirely accurate. We noted in our earlier report that Henry used Friday-to-Friday returns in his 2008 report and then changed to Monday-to-Monday returns for his 2009 report (where it turned out that, for Henry's updated sample period, Monday returns produced the lowest overall beta estimate of the five day-of-the week possibilities).[29]

52. In any event, the fact that others may have used Friday-to-Friday returns does not change the fact that the small size of the ERA's sample results in its beta estimate being unstable across days of the week. That is, our point here is:

    a) The fact that the ERA's beta estimate varies materially according to the day of the week that is used as the reference point shows that estimate is unreliable; and

[27] ERA ATCO Gas Draft Decision, p. 172, Paragraph 752. To be clear, the issue here is not about returns being calculated differently, but about the resulting estimates being different when returns are calculated in the same way on different days.
[28] For example, in our sample of 56 international comparators the beta estimates for individual firms vary depending on the day of the week that is used, but the sample is large enough that there is no variation in the overall mean estimate across the day of the week.
[29] SFG (2014), Paragraphs 377-378.

b) Estimates should be averaged over the days of the week because no particular day of the week is conceptually superior to any other.

Henry (2014)

53. In its ATCO Gas Draft Decision, the ERA considers one piece of evidence that has become available since the ERA published its Guideline. In particular, the AER has published the study performed by its consultant Henry (2014). Henry performs regression analyses for the same set of comparator firms as the ERA has used. The AER's terms of reference for Henry instructed him to constrain his analysis to the small set of domestic comparators, they instructed him about what data period to use and what statistical methods to use. Not surprisingly, the results are essentially the same as the ERA obtained when performing the same analysis on the same small sample of firms. The ERA summarises the results from Henry (2014) and concludes that:

> In summary, the Authority considers that no new evidence has been presented to contradict the estimated equity beta range determined in the Rate of Return Guidelines.[30]

54. To be clear, our point is not that the ERA or Henry have erred when applying their statistical methods to the few available domestic comparators. Rather our point is that the set of available domestic data, no matter carefully it is analysed, is simply incapable of producing reliable results.

Use of international comparators

The ERA has no regard to international comparators

55. In its ATCO Gas Draft Decision, the ERA has no regard to any international comparators, stating that:

> the Authority considered that it was inappropriate to include overseas businesses in the comparator sample which was used to estimate the required equity beta of the benchmark efficient entity. This was based on the consideration that whilst a larger sample may improve the comparator sample size, such an inclusion will be outweighed by the distortions caused due to the dissimilarity with the benchmark efficient entity. The Authority reiterates here that for gas networks, international comparators are deemed irrelevant, [31]

and:

> The Authority disagrees with utilising international data to inform a point within the equity beta range. This is a consequence of the Authority rejecting the use of international equity beta data to inform the required equity beta of the domestic benchmark efficient entity. It therefore follows that it has no weight to inform the required equity beta estimate. [32]

[30] ERA ATCO Gas Draft Decision, p. 186, Paragraph 814.
[31] ERA ATCO Gas Draft Decision, p. 169, Paragraph 739.
[32] ERA ATCO Gas Draft Decision, p. 172, Paragraph 753.

The trade-off between comparability and statistical reliability

56. When estimating betas there may need to be a trade-off between comparability and statistical reliability. Consider, for example, a listed firm seeking an estimate of its own equity beta. One approach would be to use data for that firm only. The resulting estimate would be perfectly comparable, but so statistically unreliable as to be useless. In such cases, even though a perfect comparator is available, it is routine practice to use a larger set of comparators.

57. When considering the trade-off between comparability and statistical reliability, one must weight up the reliability of the beta estimate from the proposed sample against the comparability of the firms that might be included. In the case at hand:

    a) For the reasons set out above, our view is that the ERA's proposed sample of four currently listed domestic comparators (and two firms that no longer exist) produce such unreliable estimates that it would be an error to rely on them alone; and

    b) The CEG (2013) report carefully examines the comparability of US gas distribution networks in detail and recommends a sample of 56 firms that each consist mainly of regulated distribution assets.

The ERA's application of the trade-off between comparability and statistical reliability

58. In the recent Draft Determination for the Freight and Urban Railway Networks, the ERA uses foreign comparables for the purposes of estimating an equity beta.[33]

59. In doing so the ERA has acknowledged the usefulness of examining foreign comparables in the event of insufficient Australian data. It is the because of the:

> … lack of Australian comparator companies for rail[34]

that:

> As a consequence, the Authority has relied on overseas railway network operators in order to form the benchmark samples for the estimation of the required equity beta for the PTA, Brookfield Rail and TPI railway networks.[35]

60. The ERA explicitly focuses on the small number of domestic comparators available to calculate a benchmark for equity beta:

> Nevertheless, it is clear that in rail there is a shortage of benchmark comparators for determining gearing, credit rating and equity beta.[36]

[33] Economic Regulation Authority, 2014, Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks – Draft Determination, 4 June.
[34] Economic Regulation Authority, 2014, Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks – Draft Determination, 4 June, paragraph 432.
[35] Economic Regulation Authority, 2014, Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks – Draft Determination, 4 June, paragraph 432.
[36] Economic Regulation Authority, 2014, Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks – Draft Determination, 4 June, paragraph 129.

61. The ERA is also explicit in acknowledging that while using a mix of domestic and international comparables to calculate an equity beta may not come without cost, it is nonetheless a sensible approach:

> Overall, the Authority considers that not strictly adhering to the internal consistency of the estimation method – by basing some estimates on a mix of domestic and international estimates – is reasonable in the circumstances in order to enhance the robustness of the parameter estimates. [37]

62. The ERA further acknowledges that, for calculating equity betas, using a mix of domestic and international comparables is not particularly detrimental:

> In this context, the *Authority considers that some parameters are likely to be more independent of jurisdiction than other parameters*. For instance, gearing, credit rating and *equity beta* (notwithstanding differences in, for example, tax treatment) are *likely to be more independent of jurisdiction* than are the risk free rate and market risk premium, which will be closely related to country conditions. [38]

63. The ERA concludes that, for calculating equity betas, using a mix of domestic and international comparables is reasonable, if not ideal:

> The Authority therefore considers that it is reasonable to utilise international data for estimating the benchmark gearing, credit rating and equity beta of rail facilities in Australia. This is contrary to the Authority's preference for estimates based solely on domestic financial data, but is considered warranted given the shortage of comparators. The Authority does not consider that this should create a general precedent for other determinations, where adequate domestic data is available.[39]

The ERA's explanation for the inconsistency between its gas and rail decisions

64. The ERA argues that the lack of data distinguishes the rail networks from the gas and electrical networks:

> The Authority notes that a key divergence between estimating the equity beta for rail and gas/electricity networks is the lack of Australian comparator companies for rail. [40]

65. However, in its Rail Draft Determination, the ERA estimates the equity beta for Brookfield Rail with regard to six comparator firms from Australia and New Zealand and an additional seven comparator firms from North America. For rail, a set of six local firms was deemed to be insufficient to produce reliable estimates of beta, such that North American firms had to be added to the comparator set. By contrast, the ERA concluded that a set of four currently listed firms (plus two firms that no longer exist) was sufficient to produce reliable estimates of beta, such that no regard whatsoever was given to any of the 56 North American comparators firms that had been identified.

[37] Economic Regulation Authority, 2014, Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks – Draft Determination, 4 June, paragraph 131.
[38] Economic Regulation Authority, 2014, Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks – Draft Determination, 4 June, paragraph 132.
[39] Economic Regulation Authority, 2014, Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks – Draft Determination, 4 June, paragraph 133.
[40] Economic Regulation Authority, 2014, Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks – Draft Determination, 4 June, paragraph 432.

66. That is, in its rail determination the ERA concludes that six local firms cannot produce reliable estimates of beta, but in its ATCO Gas Draft Decision the ERA concludes that the four currently listed comparators *do* produce reliable estimates of beta.

67. Moreover, the ERA states that its reason for its outright rejection of all international comparators is that:

> international gas distribution and transmission networks are subject to more competition than Australian domestic gas networks, and subject to differing regulatory regimes, tax laws, industry structure and broader economic environment. The Authority therefore considered international comparators were not relevant for constructing the benchmark efficient comparator sample.[41]

68. However, precisely the same arguments can be made about international rail comparators. For example, in its recent Aurizon Draft Decision, the QCA stated that US railroads differed from the Aurizon network in terms of competition, form of regulation, and industry structure.[42] That is, there appears to be an inconsistency between the ERA's approach in its rail and gas determinations. In both cases the sample of domestic comparators is very small and in both cases one can point to the same sorts of differences between domestic and international comparators. In its rail determination the ERA relies primarily on international comparators whereas in its gas determination it disregards them entirely.

69. Our view is that it is appropriate to first consider whether the domestic data is sufficient to produce reliable estimates of beta. If one concludes that it is not, regard must be had to international comparators. If one forms the view that (a) the domestic comparator set is too small to produce reliable estimates and (b) the international comparator set is too different from the domestic comparators to be considered, the appropriate approach would be to conclude that the available data simply cannot be used to provide a reliable estimate of beta at all. In this case, beta would be set to 1.0 – the beta of the average firm.

The ERA uses international evidence for corporate bonds

70. We also note that, in its ATCO Gas Draft Decision, the ERA has regard to international evidence to inform its estimate of the debt risk premium. The ERA concludes that the sample of 74 bonds issued in Australian dollars is insufficient and that it will also have regard to the 115 bonds issued by Australian firms in foreign currencies.

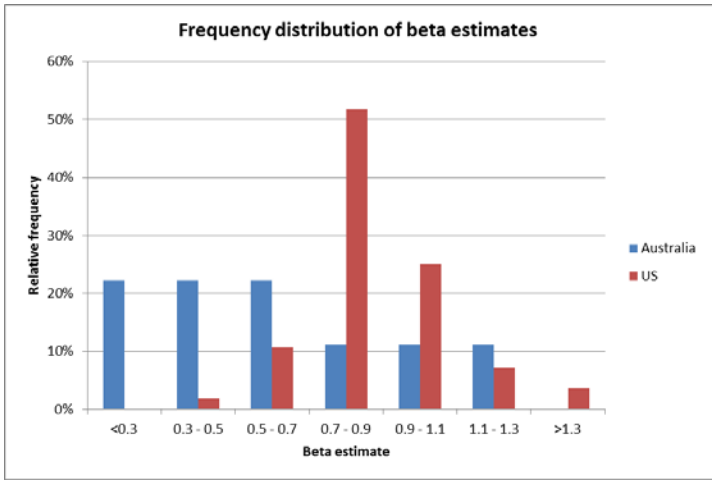
International evidence is richer, more stable and more reliable

71. SFG (2013 Beta) presented equity beta estimates for nine domestic firms (some of which are no longer listed) and 56 US firms. As noted above, the estimates for the Australian firms are disbursed over a very wide range. By contrast, the distribution of beta estimates from the much larger sample of US firms is uni-modal and approximately symmetric with a large majority of estimates within a narrow range. The distributions of the two sets of beta estimates are set out in the figure below.

72. The ERA concludes that the Australian data supports a range of 0.5 to 0.7 (no more, no less) with such a high degree of reliability that the US data is irrelevant. However, the Australian distribution looks like the distribution of a tiny sample of random numbers whereas the US distribution looks like the standard probability distribution of a statistically valid sample of estimates.

[41] ATCO Gas Draft Decision, p. 169, Paragraph 739.
[42] QCA Aurizon Network Draft Decision, Table 89, p. 247.

Figure 3. Frequency distribution of beta estimates



Source: Re-levered equity beta estimates from SFG (2013 Beta).

Tribunal consideration of sample selection issues

73. In the *Jemena Gas Networks Case*, the Australian Competition Tribunal dealt with the trade-off between comparability and statistical reliability. In that case, the Tribunal concluded that it would be wrong to rely on a small sample of more highly comparable corporate bonds, and that the sample size should be expanded to improve statistical reliability – even though that required the inclusion of bonds that might be slightly less comparable to the benchmark. In particular, the Tribunal concluded that:

> Given the paucity of relevant BBB+ bonds, it is appropriate to have regard to bonds (fixed and floating) with other credit ratings…We do not agree with Professor Handley's preferred approach to exclude non-standard bonds. Faced with a limited number of relevant bonds, it is appropriate to include bonds with nonstandard features. [43]

and further that:

> The problem is that in Australia there is relatively little corporate bond activity. There are only five issuers of BBB+ bonds in Australia with a maturity of greater than four years and this represents too small a population on which judgments can be made with any real confidence…The Tribunal is of the view that bonds should only be excluded from the sample on strong grounds (as stated in *ActewAGL*), and so classification of bonds by industry categories and the exclusion of bonds other than natural monopoly bonds is not a desirable approach. [44]

74. Similarly, the problem is that in Australia there are relatively few listed gas and electricity distribution businesses and this represents too small a population on which judgments can be made with any real confidence. Faced with a limited number of domestic comparators, it is appropriate to include international comparators.

[43] Application by Jemena Gas Networks (NSW) Ltd (No 5) [2011] ACompT 10,Paragraphs 55-57.
[44] Application by Jemena Gas Networks (NSW) Ltd (No 5) [2011] ACompT 10,Paragraphs 69, 75.

Best estimate of Sharpe-Lintner CAPM equity beta

75. Our most recent analysis of the equity beta is set out in SFG (2014 Beta). That report addresses a range of conceptual and empirical estimation issues. The primary conclusions from that report are that:

    a) The set of domestic comparators is too small to produce reliable evidence in relation to equity beta, in which case international comparators should be included; and

    b) The best available equity beta estimate for the benchmark firm is 0.82.

76. We attach that report as an appendix and adopt the estimate of 0.82 in this report. We note that the estimate of 0.82 does not include any adjustment or correction (to be fit for purpose when the Sharpe-Lintner CAPM is used as the sole approach for estimating the required return on equity) by addressing known biases in the Sharpe-Lintner CAPM. For example, it does not reflect the known low-beta bias nor the book-to-market bias – both of which are likely to be material for the benchmark efficient firm. We consider those adjustments to beta in Section 5 of this report.

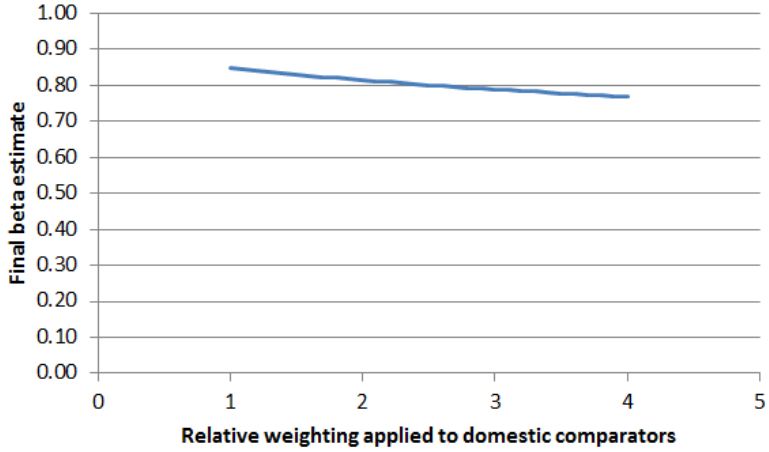
77. The final beta estimate of 0.82 in our recent report is arrived at by applying twice as much weight to the domestic comparators as to the international comparators. We explain the rationale for the application of that judgment as follows:

> The next question is to consider how much weight should be placed on the evidence from Australian-listed firms and the U.S.-listed firms. In reaching a conclusion we considered the issues of comparability and reliability. Ideally we would have a large number of Australian-listed firms to analyse. But the reality is that this sample is so small that to consider it in isolation leads to estimates that are highly unreliable, as demonstrated in our companion report. It should also be noted that the set of comparable firms from the United States was carefully scrutinised by CEG (2013) with respect to the proportion of assets under regulation, their industry classification and their prior use in comparable firm analysis for regulatory decision-making. So in reaching our final parameter estimates we allowed for each observation of an Australian-listed firm to count for twice as much weight as a U.S.-listed firm. This means that the weight placed on the evidence from the Australian-listed firms is 24% [that is, $9 \times 2 \div (9 \times 2 + 56) = 0.24$] and the weight placed on the estimates from the U.S.-listed firms is 76%.[45]

78. Whenever there are two relevant sources of data (such as the Australian and US samples), some element of judgment will be required to distil them into a single point estimate. The judgment we have applied is to assign twice as much weight to the domestic firms. In applying judgment, we considered the small set of domestic comparables (and the fact that such a small sample, by itself, produces statistically unreliable estimates) on the one hand, and the likelihood that the domestic firms are relatively more comparable to the benchmark efficient firm on the other. We weighed up this trade-off and used our judgment to assign twice as much weight to the domestic firms. We note that if we have applied equal weight to all domestic and international comparators, our final estimate of beta would have been 0.85. The final beta estimate is relatively insensitive to the extent to which the domestic comparators are over-weighted, as illustrated in Figure 4 below. Whether the domestic comparators receive equal weight or four times the weight of international comparators, the final estimate is close to 0.8.

[45] SFG (2014 Beta), Paragraph 192.

Figure 4: Final equity beta estimate by relative weighting applied to domestic comparators



Source: SFG (2014 Beta)

Conclusions in relation to equity beta

79. In our view, when estimating equity beta the ERA has erred in deciding that international comparators are not relevant evidence and should be disregarded. In our view, information relating to international regulated gas distribution networks is clearly relevant evidence. The fact that these firms are regulated gas distribution firms makes them "relevant" according to any reasonable definition of the term. In this regard, we note that NGR 87(5)(a) requires that:

> In determining the *allowed rate of return*, regard must be had to relevant estimation methods, financial models, market data and other evidence.[46]

80. Having determined that the international comparators are relevant, the next question is what weight should be applied to them vis-à-vis the domestic comparators. This question must be decided with reference to the reliability of the estimates from each sample. For example, if the sample of domestic comparators was sufficient, by itself, to produce a reliable estimate of beta, there would be no need to assign material weight to the international comparators, even though they are relevant. However, we conclude (for the reasons summarised below) that the set of domestic comparators is so tiny that it is incapable of providing reliable estimates however carefully it might be analysed. In this case, the only reasonable course is to afford some weight to the international comparators in order to improve the reliability of the estimates.

81. In our view the ERA has erred by deeming the international comparators to be irrelevant from the outset. This means that the ERA never progressed to the consideration of whether:

    a) Its estimate of beta, based exclusively on the very small number of domestic comparables, was reliable; or

    b) Whether its estimate of equity beta could be made more reliable by having regard to the international comparators.

82. Rather, the ERA deemed the international comparators to be irrelevant from the outset, which left it to do the best that it could with the small set of domestic comparators.

[46] National Gas Rules, clause 87(5).

83. In our view, the only reasonable conclusion to be drawn is that the small set of domestic comparators (there are currently only four of them) do not produce a reliable estimate of beta. The reasons for this conclusion are:

    a) The ERA's analysis of domestic comparators has led it to conclude that the systematic risk of the ATCO Gas network has reduced by a material 12.5% since its last determination. However, there have been no changes to the ATCO business operations, leverage, or any other factor that would explain such a material reduction in risk;

    b) The ERA accepts that its domestic beta estimates are highly imprecise, but erroneously concludes that this imprecision can be addressed by analysing the same small amount of data over and over again in slightly different ways. This imprecision can only be mitigated by expanding the sample size;

    c) The ERA accepts that its domestic beta estimates are unstable. Over a two-year period, the ERA's beta estimates for some domestic comparators increased by more than 20% and others decreased by more than 20%. If these firms are all comparators in the same risk class, it is impossible that some became materially more risky and others became materially less risky over the same short period. That is, the ERA's estimation process produces implausible estimates of the *change* in beta over time. It seems unlikely that the same estimation process would then produce reliable estimates of the *level* of beta;

    d) The ERA's beta estimates vary widely over time, by estimation method, by sampling frequency, and by day of the week; and

    e) The ERA adopts a range of 0.5 to 0.7 for beta. In our view, there is no basis for this range – it mixes a mid-point estimate for one bound with an upper bound estimate for the other. Moreover, the vast majority of the domestic beta estimates on which the ERA relies fall outside the range.

84. In our view, the only reasonable conclusion from this evidence is that the small set of domestic comparators is unable, by itself, to provide a reliable estimate of beta. This would reasonably lead to the consideration of foreign comparators. In this regard, we note that:

    a) A large number of international comparators are available (56 regulated distribution firms in the US);

    b) The sample of international comparators has superior statistical properties (the distribution of estimates is uni-modal and normally distributed around a clearly-defined mean); and

    c) The ERA has used international comparators to inform its estimate of beta in its rail decisions, due to the (similarly) small number of domestic comparators that are available.

85. In our view, faced with the evidence set out above, the only reasonable course of action is to have some regard to the international comparators. Our own best estimate, having what we consider to be appropriate regard to all of the relevant evidence, is 0.82. This estimate is materially different from the ERA's estimate of 0.7, and will lead to a materially different allowed return on equity when inserted into the CAPM.

86. We note that the AEMC has explicitly stated that achieving the National Gas Objective (NGO) and Revenue and Pricing Principles (RPP) requires the best possible estimate of the benchmark efficient financing costs, an important component of which is the required return on equity:

> Achieving the NEO, the NGO, and the RPP requires the best possible estimate of the benchmark efficient financing costs. The Commission stated that this can only be achieved when the estimation process is of the highest possible quality. The draft rule determination stated that this meant that a range of estimation methods, financial models, market data and other evidence must be considered.[47]

and that, in this regard, the AEMC has amended the Rules to require that:

> In determining the *allowed rate of return*, regard must be had to relevant estimation methods, financial models, market data and other evidence.[48]

87. For the reasons set out above, our view is that the ERA's current estimate of beta is not the best possible estimate. It then follows that the ERA has not produced "the best possible estimate of the benchmark efficient financing costs" as required by the AEMC above and in the Allowed Rate of Return Objective. It also follows, as set out by the AEMC above, that the ERA's allowed return will not achieve the NGO or RPP. Specifically, a key part of the NGO is to:

> promote efficient investment in…natural gas services…for the long term interests of consumers.[49]

88. An allowed return on equity that is materially below the efficient financing costs of the benchmark efficient entity will create incentives for under investment, which is not in the long-term interests of consumers.

89. Similarly, the RPP require that:

> regard should be had to the economic costs and risks of the potential for under and over investment, [50]

and that:

> a reference tariff should allow for a return commensurate with the regulatory and commercial risks involved.[51]

90. It is difficult to see how these principles can be complied with if the allowed return does not reflect the best possible estimate of the efficient financing costs of the benchmark efficient entity.

91. The RPP also require that:

> a service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs,[52]

[47] AEMC Rule Change Final Determination, p. 43.
[48] National Gas Rules, clause 87(5).
[49] National Gas Law, s. 23.
[50] National Gas Law, s. 24(6).
[51] National Gas Law, s. 24(5).
[52] National Gas Law, s. 24(2).

which would seem to require that the allowed return must be at least commensurate with the efficient financing costs of the benchmark efficient entity.

92. For all of the reasons set out above, our view is that the ERA's estimate of beta is based on a number of errors and that correction of those errors would lead to a materially preferable estimate of the allowed return on equity that is more consistent with the ARORO, NGO and RPP.

3. Market risk premium

The ERA Guideline

93. In its Guideline, the ERA proposes to use a three-step approach to estimate MRP. In the first step, the ERA proposes a range of 5% to 7.5% based on:

    a) An historical mean estimate in the range of 5-7%; and

    b) A DGM estimate in the range of 6-7.5%.

94. In the second step, the ERA adopts a point estimate of 6% from within this range based on:

    a) The ERA's assessment that "the level of perceived risk in the equity market appears to be in the lower half of the range at the current time" [53]; and

    b) "the evidence suggesting that the return on equity is mean reverting." [54]

95. The third step is to apply cross checks to the point estimate, however in the Guideline the ERA sets out no relevant cross checks and simply maintains the point estimate of 6%.

The ATCO Gas Draft Decision

96. In its ATCO Gas Draft Decision, the ERA maintains the range for MRP of 5% to 7.5% from its Guideline. The ERA is very clear about the fact that this is an estimate of the current forward-looking MRP – that it reflects the ERA's assessment of *current* market conditions:

> the Rate of Return Guidelines established upper and lower bounds based on reasonable estimates for the range of potential future outcomes, given the period of five years in question. The Authority considers that this provides a reasonable range for expectations for future outcomes *over the next five years*, while taking prevailing market conditions into account at the time of the decision. [55]

97. The Draft Decision then sets out four variables (volatility, dividend yield, swap spread, and DRP) that the ERA refers to as "forward-looking indicators." [56] The current value of each of these variables is then compared against the history of that variable over the last 7, 15 or 20 years (depending on the length of the historical series available to the ERA). The ERA computes where the current value lies in relation to the historical range. For example, suppose the DRP ranges between 1% and 7% over the period selected by the ERA (where 1% is pre-GFC and 7% is for a very short period at the peak of the GFC). Also suppose that the current value of the DRP variable is 2.5%. The ERA would conclude that this variable currently supports an MRP of:

$$5\% + \frac{1.5\%}{6\%} \times 2.5\% = 5.625\%.$$

98. That is, we start at the bottom of the ERA's current range for the forward-looking MRP. This is currently 5%. Then we note that the current DRP is 1.5% above its historical minimum (i.e., the current DRP of 2.5% is 1.5% above its minimum historical value of 1%). Next, we note that the

[53] ERA Rate of Return Guideline, Appendix 30, Paragraph 20.
[54] ERA Rate of Return Guideline, Appendix 30, Paragraph 22.
[55] ERA ATCO Gas Draft Decision, p. 162, Paragraphs 705-706, emphasis in original.
[56] ERA ATCO Gas Draft Decision, p. 166, Paragraph 725.

historical range of DRP observations is 6% (maximum of 7% less minimum of 1%). Since the current DRP is a quarter (1.5/6) of the way through its *historical* range, the ERA suggests that the MRP should be a quarter of the way through its *current* range of 2.5% (maximum of 7.5% less minimum of 5%).

99. The ERA performs this exercise for each of the four forward-looking indicators it has identified. This produces four MRP estimates. The ERA then applies specific weights to each of the four estimates then rounds off its final point estimate to 5.5%.

100. The use of the four indicator variables to select a point from within the 5% to 7.5% range was not set out in the Guideline – this is a new development in the ATCO Gas Draft Decision.

Major logical error

101. In our view, the ERA has committed a logical "apples and oranges" error by comparing each indicator variable relative to its *historical* mean with its own range for the *current forward-looking* MRP.

102. Any consideration of indicator variables relative to *their* history can only (logically) be used to inform the estimate of MRP relative to *its* history. For example, suppose it is the case that (historically):

    a) When the DRP was 1% (its minimum value over the historical period) the point estimate of MRP was 5%; and

    b) When the DRP was 7% (its maximum value over the historical period) the point estimate of MRP was 11%.

103. In this case, it might make sense to say that if the DRP is currently 2.5% (a quarter of the way through its historical range) the MRP is 6.5% (a quarter of the way through its corresponding historical range of 5%-11%).[57] Under this approach, when the indicator variable is low relative to some historical period, we would expect the MRP to be correspondingly low – relative to its values over the *same historical period*.

104. However, the ERA proposes to compare each indicator variable relative to its *historical* mean with the ERA's range for the *current forward-looking* MRP. To illustrate why this is a problem, we extend the example above. We start with the ERA's long-run average MRP estimate of 5%-7%, which is an estimate of the MRP range for *average* market conditions. We then take the ERA's MRP range for the *current* market conditions of 5%-7.5%. That is, the current range (according to the ERA's numbers) indicates that the current conditions are such that the forward-looking MRP is somewhat above its long-run average. The ERA then selects a point estimate from near the bottom of the range (5.5%) on the basis that the DRP is currently (2.5%) well below its value during the GFC (7%). This approach has led the ERA into error, as explained below.

105. The range of 5%-7.5% reflects the ERA's estimate of the forward-looking MRP, based on its assessment of the current market conditions. The ERA is of the view that the current forward-looking MRP could be as low as 5% in the current market conditions or as high as 7.5% in the current market conditions. The range reflects the precision with which the ERA believes it can estimate the current forward-looking MRP in the current market conditions. At present, the ERA is of the view that the best it can do with the current data is to narrow down its estimate of the forward-looking MRP to the range of 5%-7.5%.

[57] A better approach would be to compare the current value against the mean of historical values, rather than against the range of historical values. In the example above, a DRP of 4% is at the mid-point of the historical range, but would be greater than 95% of the historical observations. This is because the maximum value of 7% is extreme by historical standards and applied to a very short period.

106. It is very important to note that the ERA's range of 5%-7.5% does *not* represent the range of what the MRP could be in *different* market conditions. That is, the ERA is *not* saying that the MRP could be as low as 5% in *some* market conditions and as high as 7.5% in *other* market conditions. Rather, the ERA is saying that the MRP could be as low as 5% in the *current* market conditions or as high as 7.5% in the *current* market conditions. That is, the range does not reflect the variation in MRP over different market conditions, it reflects the precision with which the ERA feels it can estimate the *current* MRP in the *current* market conditions. It makes no logical sense to select a point estimate from within the range for the *current* MRP (which range reflects estimation precision) on the basis that the DRP indicator variable is lower than its GFC peak.

107. Moreover, the ERA is *not* saying that because the DRP indicator variable is below its GFC peak, the MRP must also be below its GFC peak. Such a statement would have some logic to it. Rather, the ERA is saying that because the DRP indicator variable is below its GFC peak, we will select a point from near the bottom of the range that reflects the forward-looking MRP in the current market conditions. Where the DRP might be relative to its GFC peak should have nothing at all to do with how the ERA resolves the imprecision with which it has estimated the forward-looking MRP that reflects current market conditions.

How should indicator variables be used?

108. In our view, IPART (2013) sets out the proper use of indicator variables in the regulatory setting. They consider indicator variables relative to *their* historical distribution to provide some indication of where the MRP might be relative to *its* historical distribution. In particular, IPART sets out an MRP range of 3% to 9%. The interpretation of this range is that the MRP could be as low as 3% in *some* market conditions and it could be as high as 9% in *other* market conditions. Note that this is quite different from the ERA's range of 5% to 7.5% for the *current* market conditions.

109. IPART then considers the current value of each indicator variable relative to its historical distribution. This is done using percentile scores. For example, if the current value of a particular indicator variable is higher than 75% of the values over the historical sample, its percentile score is 0.75. This variable then suggests a current MRP 75% of the way through the range – or 7.5%.[58] This is done on the basis that, since the indicator variable is above 75% of the values that relate to a range of different market conditions, the MRP is likely to be above 75% of *its* values that relate to a range of different market conditions.

110. There are two key differences between the IPART approach and the ERA approach:

    a) As set out above, IPART use a range for what MRP could be over the range of market conditions whereas the ERA use a range for the current market conditions only. We explain above why the ERA approach is wrong; and

    b) IPART use a percentile approach whereas the ERA use a distance approach. To see the difference, consider an example where we have an historical sample of 100 observations for a particular indicator variable. Suppose that 98 of those observations vary between 0 and 1 and that the other two observations are 4 and 10, respectively. Now consider the implied MRP at the time where the indicator variable takes a value of 4. The IPART approach would say that this observation is above 98% of the sample, which suggests that the current MRP is near the top of the range. The ERA approach would say that this observation is below the mid-point of the range for that variable (0-10), which suggests that the current MRP is below

[58] 3%+0.75×(9%-3%)=7.5%

the mid-point of its range – even though it is more than four times larger than 98% of the historical observations of that variable.

111. In our view, the IPART approach is reasonable in these two respects and the ERA approach is not.

The impact of imputation credits

112. The ERA's Guideline adopts a range for MRP of 5%-7.5%. These are estimates of the with-imputation MRP that reflects the assumed benefits of imputation credits. The Guideline adopted an estimate of gamma of 0.3. That is, the 5%-7.5% range reflects gamma of 0.3.

113. The ATCO Gas Draft Decision also adopts a range for MRP of 5%-7.5%, but sets gamma to 0.5. That is, the assumed value of imputation credits has nearly doubled, but there is no change to the ERA's estimate of MRP. The ERA has not explained how it is possible that imputation credits are now considered to be nearly twice as valuable, but the MRP has not changed at all – even though the MRP estimates on which the ERA rely are a function of the assumed value of imputation credits. In particular, the ERA relies on historical stock return data which has been grossed-up to include the assumed value of imputation credits, and dividend discount models that are based on future dividends – which also have to be grossed-up to reflect the assumed value of imputation credits. That is, both sources of data that the ERA rely upon include adjustments for the assumed value of imputation credits. If the assumed value of imputation credits changes materially, the estimate of MRP must change accordingly. However, the ERA appears to have materially changed its estimate of gamma, but continued using its previous estimates of MRP, which embed a materially different estimate of gamma.

Historical excess returns

114. The ERA's Guideline concludes that historical excess returns support an MRP estimate of 5%-7%.[59] This is based on a series of estimates set out in Table 14 of the ERA's Guideline Explanatory Statement.[60]

Updating and correcting the data

115. In our view, the data on which the ERA relies should be updated and corrected in the following respects:

    a) The various historical return estimates on which the ERA relies use sample periods that end in 2008, 2010, and 2011 respectively. That is, the most recent estimates are nearly three years out of date.

    b) The estimates depend on the assumption about the value of distributed imputation credits. Since its Guideline, the ERA has materially changed its estimate of gamma. If that new gamma estimate is to be maintained, the MRP would have to be revised to be consistent with it.

    c) As set out in our previous report,[61] NERA (2013) have identified an inaccuracy in the Brailsford et al (2008, 2012) estimates that should be corrected.

116. We have performed the updates and corrections set out above and report the updated estimates in Table 2 and Figure 5 below.

[59] ERA Rate of Return Guideline Explanatory Statement, p. 152, Paragraph 714.
[60] ERA Rate of Return Guideline Explanatory Statement, p. 152.
[61] SFG (2014 ERA).

Table 2
Mean excess return by sampling period

Period	Mean excess return
1883 to 2013	6.8%
1937 to 2013	6.1%
1958 to 2013	6.7%
1980 to 2013	6.7%
1988 to 2013	6.1%

Source: NERA data through to 2011, updated from RBA publications.
These values include imputation credits (valued at 70% of face value) on franked dividends paid since 1987.

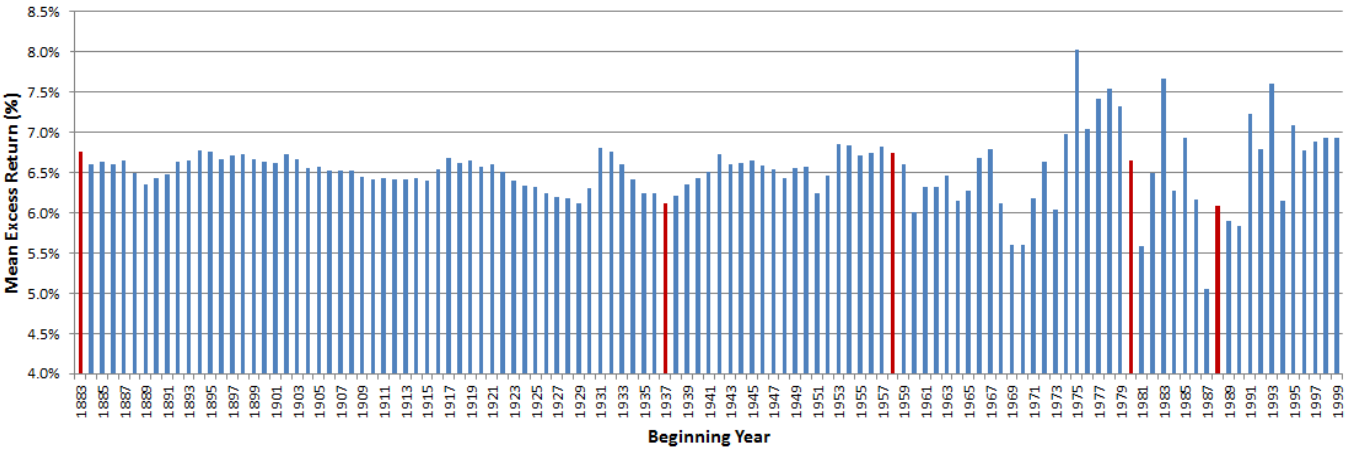
117. Table 2 shows that the mean excess return from every one of the sample periods exceeds 6%. The average estimate over the five sample periods is 6.5%.[62]

118. Figure 5 shows the mean excess return through to 2013 as the beginning year of the sample period varies. That is, the first bar represents the mean excess return from 1883 to 2013, the second pertains to the period 1884 to 2013, and so on. The five start dates used in the Guideline materials are highlighted. We note that the volatility of these estimates increases from left to right as the sample size becomes smaller. Of all of the estimates set out in Figure 5:

a) 95% are greater than 6%; and

b) 58% are greater than 6.5%.

Figure 5: Mean excess return to 2013



Source: NERA data through to 2011, updated from RBA publications.
The five start dates used in the Guideline materials are highlighted in red.

Mapping point estimates to a range

119. In its ATCO Gas Draft Decision, the ERA explains that the 5%-7% range for MRP that it obtains from its analysis of historical excess returns does not represent a "statistical range" or confidence interval.[63] Rather, it represents the range of point estimates from various different sample periods, whereby:

[62] The mean over the five periods is essentially a weighted-average wherein more recent periods receive progressively more weight than older periods.
[63] ERA ATCO Gas Draft Decision, p. 161, Paragraph 702.

> …multiple estimations of each based on various sets of data (as opposed to a single set) were considered appropriate to establish a range for the MRP. The statistical range around each of the various estimates was not used in establishing the range of 5 per cent to 7.5 per cent. The resulting range spanned the outcomes of the estimates the Authority considered fit for purpose. [64]

120. On this basis, the range of estimates from historical data would appear to be 6.1% to 6.8%, as set out in Table 2 above.

Information about average market conditions

121. We agree with the ERA that historical excess return estimates are relevant data that should be considered when estimating MRP. In our previous report, we used historical excess return estimates to inform our proposed estimate of MRP.[65] Consequently, the ERA is not right to say that:

> SFG also contends that long run (or unconditional) estimates such as historic averages should not be used in forming a range for the MRP. [66]

122. The point we were making in our previous report is that historical excess returns are only capable of providing information about the MRP over the average market conditions that applied during the relevant sample period. Logically, this method only produces an estimate that is commensurate with the prevailing market conditions if the prevailing conditions happen to be close to the long-run average conditions. The weight that is applied to the historical average estimate would then depend on how closely the prevailing conditions mirror the average conditions over the relevant historical period. In this regard, we note that in the present case government bond yields are currently at the extreme end of their historical distribution.

123. In our view, all of the available data should be used to maximise the statistical reliability of the estimate of the average excess return. Data periods that begin in the 1980s are too short to provide any sort of meaningful estimate. For example, when theta is set to the Guideline value of 0.7, a sample period beginning in 1980 would have produced MRP estimates of 7.6% in 2007, 5.7% in 2008 and 6.7% in 2009. We recognise that there is an argument that more recent data might be more representative, and that the reliability of the data improved in 1958. However, Table 3 shows that the MRP estimates are not materially different even if the data set is constrained to post-1958 data only. Consequently, we adopt historical MRP estimates based on the entire data set in the remainder of this report.

Table 3
Current estimates of MRP from historical data: Ibbotson approach

	Theta=0.35	Theta=0.7
Entire data set	6.63%	6.76%
Post-1958 data only	6.45%	6.74%

Source: NERA data through to 2011, updated from RBA publications.

124. In Table 4 below we set out our current estimates of the MRP and the required return on the market from the Ibbotson historical excess returns approach. We show estimates for different assumptions about theta (the ERA's current figure of 0.35 based on the Tribunal's finding, and the ERA's

[64] ERA ATCO Gas Draft Decision, p. 161, Paragraph 702.
[65] SFG (2014 ERA), Paragraph 428.
[66] ERA ATCO Gas Draft Decision, p. 161, Paragraph 703.

proposed new estimate of 0.7) and for different assumptions about the risk-free rate (the yield on five-year or ten-year government bonds as at 9 September 2014). These estimates are based on the most recently available data and apply the NERA dividend yield corrections where relevant.[67]

Table 4
Current estimates from the Ibbotson approach

	Theta=0.35	Theta=0.7
Required return on the market		
Risk-free rate of 2.95%	9.58%	9.71%
Risk-free rate of 3.58%	10.21%	10.34%
Market risk premium		
Risk-free rate of 2.95%	6.63%	6.76%
Risk-free rate of 3.58%	6.63%	6.76%

Source: RBA, NERA, SFG calculations.

Wright approach

The Wright approach produces relevant evidence

125. There are two ways to process the historical returns data:

a) The Ibbotson approach assumes that the MRP is constant over all market conditions and the required return on equity varies one-for-one with changes in the risk-free rate; and

b) The Wright approach assumes that the required return on equity is more stable and the MRP varies over different market conditions.

126. In its ATCO Gas Draft Decision, the ERA confirms that:

> consistent with the evidence, the Authority's view is that the return on equity is more stable than the MRP, over the longer term. [68]

127. In our view, both methods of processing the historical data provide relevant evidence in which case regard should be had to both.

128. In its ATCO Gas Draft Decision, the ERA confirms that:

> the approach to determining the MRP, is informed by the Wright approach[69]

and that the bounds for the estimate of MRP are developed with reference to the Wright approach.[70]

129. However, no estimate of the Wright approach is presented anywhere in the ATCO Gas Draft Decision. Rather, the ERA appears to suggest that its dividend growth model (DGM) estimate substitutes for the Wright approach.[71] However, the ERA's DGM approach is *not* a substitute for the Wright approach at all:

[67] We note that the Ibbotson estimates are independent of the assumption about the risk-free rate, but adopt this same table format for other estimation methods below, which do vary according to the risk-free rate assumption.
[68] ERA ATCO Gas Draft Decision, p. 163, Paragraph 712.
[69] ERA ATCO Gas Draft Decision, p. 156, Paragraph 674.
[70] ERA ATCO Gas Draft Decision, p. 163, Paragraph 711.
[71] ERA ATCO Gas Draft Decision, p. 164, Paragraph 714.

a) The Wright approach is a method for processing the *historical* data, whereas the DGM estimate is based on current stock prices and *forecasted* dividends; and

b) The ERA's DGM estimate of MRP is 6%-7.5% whereas the Wright approach produces a current estimate of 8.75%.[72]

130. In our view, the ERA has erred in its conclusion that the DGM can be used as a replacement for the Wright approach. This conclusion has led the ERA to process the historical data using the Ibbotson method only, which runs entirely counter to the ERA's conclusion that the return on equity is likely to be more stable than the MRP – which would favour the Wright approach over the Ibbotson approach.

131. In our view, the Ibbotson and Wright methods both produce relevant data and should both be used to process the historical stock returns data. The ERA's DGM approach is not a substitute for the Wright approach – it is an entirely different approach that relies on entirely different data and produces a materially different estimate.

In summary, although the ERA states that the bounds for the estimate of MRP are developed with reference to the Wright approach,[73] no estimate of the Wright approach is ever presented. Rather the ERA's range for MRP is created exclusively by the intersection of its Ibbotson and dividend discount model ranges.

Current estimates from the Wright approach

132. We have computed the average real return on the market portfolio using:

a) Data from 1883 to 2013, inclusive;

b) The NERA (2013) correction for the inaccuracy of the Brailsford et al (2012) dividend yield adjustment; and

c) Estimates of the value of distributed imputation credits set to 0.35 (consistent with the Tribunal estimate and previous decisions of the ERA) and 0.7 (consistent with the ATCO Gas Draft Decision).

133. The average real return on the market portfolio (including imputation credits with theta set to 0.7) is 9.10%. If expected inflation is set to 2.5% (the mid-point of the RBA target band), a 9.10% real return is consistent with a nominal return of 11.83% (using the standard Fisher relation). That is, if the current real market return is expected to be the same as the long-run historical average, the current nominal required return is 11.83%. In summary, the Wright approach currently produces the estimates set out in Table 5 below. We note that the Wright approach produces an estimate of the required return on the market from which the risk-free rate is subtracted in order to produce an estimate of the MRP.

[72] The Wright approach produces an estimate of the required return on the market of 11.7%. Subtracting the ERA's risk-free rate estimate of 2.95% yields an MRP estimate of 8.75%.
[73] ERA ATCO Gas Draft Decision, p. 163, Paragraph 711.

Table 5
Current estimates from the Wright approach

	Theta=0.35	Theta=0.7
Required return on the market		
Risk-free rate of 2.95%	11.71%	11.83%
Risk-free rate of 3.58%	11.71%	11.83%
Market risk premium		
Risk-free rate of 2.95%	8.76%	8.88%
Risk-free rate of 3.58%	8.13%	8.25%

Source: RBA, NERA, SFG calculations.

Dividend discount models[74]

134. In its Guideline, the ERA explains (quite correctly in our view) that dividend discount models provide an estimate of the expected return on the market. In particular, each specification produces a particular estimate of the expected return on the market. The ERA considers a number of specifications and forms a range from among the resulting estimates. From the estimate of the return on the market, one can subtract the contemporaneous risk-free rate to obtain an estimate of the contemporaneous market risk premium. That is, dividend discount models do not produce a direct estimate of the MRP – they produce an estimate of the expected return on the market:[75]

> The DGM estimates the required rate of return for an asset by equating the present value of expected cash flows with the observed price of the asset. The **dividend growth model can be used to estimate the expected market return** by equating the present value of forecast future dividends of an index, and equating this with the observed price of the index. **By subtracting the relevant risk free rate**, an estimate of the expected market risk premium can be derived. [76]

135. The ERA goes on to state that:

> The dividend growth model assumes that the market cost of equity never changes over time which implies that any change in the risk free rate is perfectly offset by an opposite change in the MRP. [77]

136. What the ERA apparently means is that, having used the dividend discount approach to obtain an estimate of the required return on the market, one then subtracts the contemporaneous risk-free rate to obtain an estimate of the MRP. As the risk-free rate fluctuates over time, the resulting estimate of MRP also fluctuates, but in the opposite direction. This would continue until the dividend discount model is re-estimated to produce a new estimate of the required return on the market.

[74] We adopt the term "dividend discount model" on the basis that the approach involves estimating the required return by discounting future dividends to find their present value. In practice, the term "dividend growth model" is often used to describe a very simplistic version of the dividend discount approach whereby *all* dividends are assumed to grow at a constant rate.

[75] Whereas the ERA's Guideline refers to dividend discount models producing an estimate of the "expected" return on the market, our view is that a more descriptive term is the "required" return on the market. Investors will forecast future dividends and them discount them back to present value using the rate of return that they *require* at the time. This is the return that dividend discount models seek to estimate. This point is largely semantic in this context – the key point being that dividend discount models produce an estimate of the market *return* and not an estimate of the market risk premium.

[76] ERA Rate of Return Guideline Explanatory Statement, p. 154, Paragraph 721, emphasis added.

[77] ERA Rate of Return Guideline Explanatory Statement, p. 154, Paragraph 721.

137. The Guideline goes on to report a range of estimates that were computed by the ERA. These estimates came from the ERA inputting various different combinations of parameters into its own specification of the dividend discount model.[78] In our view, there are a number of problems with the ERA's estimates. By way of one example, the ERA notes that actual dividends through the peak of the GFC period were materially lower than what analysts were predicting before the GFC hit. The estimates in Table 16 of the ERA's Explanatory Statement are based on the assumption that, as at August 2013, future dividends will continue to fall short of analyst forecasts by that same amount – in perpetuity. Such an assumption is obviously nonsensical.

138. However, the ERA's particular specification is a moot point because in its ATCO Gas Draft Decision, the ERA explains that it has not relied at all on its own estimates, but rather has taken the median of a range of estimates from various reports:

> The Authority considered 11 different estimates and based on a median of these observations established the top of the MRP range as 7.5 per cent. It did not rely on its own DGM estimate to inform the range.[79]

139. The ERA's Guideline sets out the 11 estimates on which it relies and those estimates are reproduced in Table 7 below.

Table 6
Dividend discount estimates relied upon by the ERA

Report	Risk-free rate (%)	MRP (%)	Required return on the market (%)
CEG	3.77	8.52	12.29
Capital Research	5.08	6.62	11.70
Capital Research	5.08	7.15	12.23
Capital Research	5.08	7.63	12.71
Capital Research	3.73	9.56	13.29
NERA	3.96	7.74	11.70
NERA	5.50	6.20	11.70
NERA	3.99	7.71	11.70
CEG	3.05	8.89	11.94
Lally	3.26	7.15	10.41
SFG	5.30	6.30	11.60
Median			11.70

Source: ERA Rate of Return Guideline Explanatory Statement, Table 17, p. 158.
Where the ERA sets out a range for MRP, we use the mid-point in the table above.

140. Recall from above that the dividend discount approach produces an estimate of the required return on the market. One then subtracts the risk-free rate at the time to obtain an estimate of the MRP at the time. Table 7 shows that the median estimate of the required return on the market is 11.70%.

141. The ERA has indicated that it maintains its reliance on this same set of evidence for its ATCO Gas Draft Decision. The dividend discount models on which the ERA relies produce a median estimate of the required return on the market of 11.7%. Subtracting the ERA's current estimate of the risk-free rate (2.95%) produces an estimate of the market risk premium of 8.75%.

[78] ERA Rate of Return Guideline Explanatory Statement, Tables 15 and 16, pp. 156-157.
[79] ERA ATCO Gas Draft Decision, p. 165, Paragraph 722.

142. However, the ERA now proposes that the dividend discount evidence supports an estimate of the required return on the market of 8.95% to 10.45%.[80] In our view, it is an error to interpret the dividend discount evidence in Table 6 in this way. The dividend discount approach produces an estimate of the required return on the market, from which the risk-free rate is subtracted. By contrast, the ERA has interpreted the dividend discount approach as though it produces a direct estimate of MRP, which is independent of the risk-free rate. In our view, this is a clear error.

143. Moreover, the ERA's interpretation of some of the estimates in the above table leads to its estimate of MRP being conservatively low. Two examples of this relating to our own SFG (2013 DDM) study are:

a) SFG (2013 DDM) report estimates of MRP for every six-month period beginning in 2002. The ERA reports the range of estimates as 4.7%-7.9%, but the lower figures clearly relate to periods from many years ago. SFG (2013 DDM) clearly reports that its most recent contemporaneous estimate is 7.6%;[81] and

b) SFG (2013 DDM) clearly state that the estimates in their Table 12 are ex-imputation estimates and devote an Appendix to explaining how they would be adjusted to incorporate various assumptions about imputation credits.[82] However, the ERA interprets all of the estimates above as being with-imputation estimates.

144. Consequently, our conclusion is that the dividend discount evidence on which the ERA relies currently supports an estimate of the required return on the market of at least 11.70% and an estimate of the MRP of at least 8.75%.

145. Our preferred approach was set out in our previous submission to the ERA.[83] Our current estimates from the dividend discount approach are set out in Table 7 below. We note that the dividend discount approach produces an estimate of the required return on the market from which the risk-free rate is subtracted in order to produce an estimate of the MRP.

Table 7
Current estimates from the dividend discount approach

	Theta=0.35	Theta=0.7
Required return on the market		
Risk-free rate of 2.95%	11.42%	12.53%
Risk-free rate of 3.58%	11.42%	12.53%
Market risk premium		
Risk-free rate of 2.95%	8.47%	9.58%
Risk-free rate of 3.58%	7.84%	8.95%

Source: RBA, Datastream, SFG calculations.

[80] This is the sum of the ERA's risk-free rate of 2.95% and the end points of its range for the MRP based on dividend discount models of 6% to 7.5%.
[81] SFG (2013 DDM), Table 12, p. 36.
[82] SFG (2013 DDM), Appendix 2, pp. 37-40.
[83] We deal with the ERA's comments on the technical aspects of our approach in Section 5 below, where that same approach is applied to the benchmark firm rather than to the broad market.

Independent expert reports

Overview

146. In its ATCO Gas Draft Decision, the ERA concludes that independent expert valuation reports can be used as a cross check, but not as evidence to inform the range for MRP or the selection of a point estimate from within the range:

> The Authority considers that independent analyst reports are useful as cross checks, but do not directly compare to the Authority's estimate for the five year regulatory period. [84]

147. We note that other regulators, including the AER, QCA and IPART have decided that evidence from independent expert valuation reports will be used to inform their calculation of a point estimate for the market risk premium.

148. The ERA considers, in some detail, the Grant Samuel independent expert report in relation to Envestra. This is a highly relevant report, given that it is timely and that it relates to a business that is engaged in gas distribution. The ERA concludes that:

> Grant Samuel ultimately assess an overall equity market return to be in the range of 10.7 to 15.2 per cent [85]

149. The ERA's own estimate of the overall equity market return is 8.45%.[86] Thus, the mid-point of the Grant Samuel range is 53% higher than the ERA's estimate.

150. The ERA considers the Grant Samuel estimate as a cross check of its own estimate and concludes that:

> On this basis, the Authority is satisfied that its current estimate…is reasonable. [87]

151. The ERA suggests that although its current estimate of the required return on the market is only 8.45%, it anticipates that over the long-run future its estimate will increase to 10.9%. The ERA then notes that its:

> long run average of its estimates of the 5 year return on equity of 10.9 per cent is within the Grant Samuel range of 10.7 to 15.2 per cent.[88]

Logical interpretation problems

152. In our view, there are three logical problems with the ERA's conclusion that its 8.45% estimate of the required return on the market passes the application of its Grant Samuel cross-check:

    a) Grant Samuel provide an estimate of the *current* required return on equity – it is their estimate of the return that investors would reasonably require from a contemporaneous equity investment in a gas distribution business such as Envestra. In our view, this should be

[84] ERA ATCO Gas Draft Decision, p. 157, Paragraph 679.
[85] ERA ATCO Gas Draft Decision, p. 179, Paragraph 786.
[86] The sum of the risk-free rate and market risk premium.
[87] ERA ATCO Gas Draft Decision, p. 179, Paragraph 788.
[88] ERA ATCO Gas Draft Decision, p. 179, Paragraph 786.

compared with the ERA's estimate of the *current* required return on equity, not the return on equity that the ERA might estimate at some time in the future;

b) Even if one accepted that the ERA *would* eventually revert to using a 10.9% estimate for the required return on the market, its *current* estimate for the next five years is 8.45%. Consequently, its long-horizon estimate would be a weighted-average of its current (historically low) estimate and its expected future estimates over some period of transition back to its long-term estimate of 10.9%. The current estimate would receive disproportionately higher weight because it applies to near-term cash flows. Thus, the weighted-average estimate would fall below the Grant Samuel range;[89] and

c) Even if this was the correct basis of comparison, the fact that 96% of the Grant Samuel range is above the ERA long-run estimate would be a relevant consideration when determining whether or not the ERA estimate is corroborated by Grant Samuel.

Adjustments for imputation credits

153. Another problem relating to the ERA's comparison of its own estimate with the Grant Samuel estimate is that that its own estimate has been inflated to include its assumed value of imputation credits whereas the Grant Samuel estimate has not. That is, the ERA compares its own *with-imputation* estimate with the Grant Samuel *ex-imputation* estimate.

154. On this point, the ERA first notes that Grant Samuel have made no adjustment in relation to imputation credits anywhere in their analysis. Indeed, Grant Samuel specifically state, in relation to imputation credits, that:

> It is Grant Samuel's opinion that it is not appropriate to make any adjustment.[90]

155. Grant Samuel state that the reason for making no adjustment is that:

> Grant Samuel does not believe that such adjustments [for imputation credits] are widely used by acquirers of assets at present…there is no clear evidence that they will actually pay extra for them or build it into values based on long-term cash flows.[91]

156. We concur with the Grant Samuel assessment on this issue and note that it is consistent with the dominant market practice.[92]

157. By contrast, when estimating the required return on equity the ERA *has* made adjustments for imputation credits. These adjustments are made via the MRP parameter; specifically to the two estimation approaches that determine the range for MRP, from which the ERA selects its point estimate:

[89] The ERA's point here is that its current allowed return on the market of 8.45% is expected to revert to a long-run average of 10.9% over time and that some sort of average of its 8.45% allowance for the next five years and its 10.9% average allowance thereafter is what should be compared with the long-run required return on the market used in practice. However, these two estimates are averaged, the result will be an allowance that is materially below the bottom of the Grant Samuel range.
[90] Grant Samuel (2014), p. 10.
[91] Grant Samuel (2014), p. 10.
[92] For evidence that the dominant market practice is to make no adjustment for imputation credits, see Lonergan (2004), KPMG (2006), and Truong, Partington and Peat (2008).

a) The historical excess returns have been increased to reflect the assumed value of imputation credits. The returns in each year since imputation was introduced in 1987 have been increased by theta multiplied by the amount of imputation credits distributed that year; and

b) The dividend discount models that the ERA relies upon use grossed-up dividends that include the assumed value of imputation credits. Again, forecasted dividends have been increased by theta multiplied by the amount of imputation credits distributed that year.

158. Both of the estimates of MRP that form the ERA's range are *with-imputation* estimates. They are higher than they would otherwise be due to the incorporation of some assumed value for imputation credits (via the theta parameter).

159. This approach of increasing the estimate of the required return (by grossing-up the MRP estimate) is standard regulatory practice. For example, the QCA is quite explicit about the adjustments it makes in its recent Market Parameters Decision. In relation to MRP estimates based on historical excess returns the QCA states that:

> The estimates are based on a 10-year risk-free rate and include an [upward] adjustment for dividend imputation in relevant years to reflect the QCA's preferred utilisation rate of 0.56.[93]

and in relation to dividend discount models the QCA states that it begins with a cash dividend yield of 4.60% and then makes "an adjustment for imputation credits" to increase the dividend yield to 5.43%.[94]

160. That is, when a positive value of gamma (and theta) is applied, the estimates of MRP need to be grossed-up and will be higher than they would otherwise be. If Grant Samuel had followed the ERA's practice of adopting a positive value of gamma (rather than 0), it would need to gross-up its estimate of MRP using the same approach that regulators adopt. This (higher) grossed-up MRP would then be used to produce a (higher) with-imputation estimate of the required return on equity. This is precisely what is done when regulators adopt a positive value of gamma.

161. By contrast, the ERA concludes as follows:

> The Authority considers that if Grant Samuel did account for the impact of imputation credits, then it would need to adjust its observed return on the market estimate (k_E') accordingly (down). The Authority considers that with a revised assumption of a positive γ, the resulting grossed up return on equity would likely be similar to Grant Samuel's current estimate of k_E, all other things equal.[95]

162. That is, the ERA implies that if Grant Samuel was instructed to provide an estimate of the required return on equity where gamma is set to 0.5, their new estimate would be "similar" to their existing estimate. The implication is that Grant Samuel's final estimate of the market return is independent of the assumed value of imputation credits. However, as set out above, the higher the assumed value of imputation credits, the higher the grossed-up estimate of MRP. We can see no basis for the ERA's proposed initial downward adjustment to the ex-imputation market return (that the ERA refers to as k_E' above). The ex-imputation market return is based on historical excess returns and dividend discount estimates and is what it is. That ex-imputation estimate would then be increased by the

[93] QCA (2014) Market Parameters Decision, p. 58.
[94] QCA (2014) Market Parameters Decision, p. 72.
[95] ERA ATCO Gas Draft Decision, p. 179, Paragraph 786.

assumed value of imputation credits – in accordance with the standard regulatory practice. The higher the assumed value of imputation credits, the higher the grossed-up market return would be.

163. In summary, our view is that:

a) Independent experts estimate the market return without making any upward adjustment in relation to imputation credits. This estimate is based on dividends and capital gains and has no regard to imputation credits; and

b) If they were instructed to include a particular value for imputation credits they would obtain a commensurately higher estimate of the market return. This is because the same dividends and capital gains data would be used and imputation credits are now assumed to have some positive value.

164. We note that other regulators share our views on this matter. For example, the QCA uses independent expert valuation reports as relevant evidence to inform its estimate of MRP. The QCA recognises that independent experts report an ex-imputation estimate of MRP that reflects a gamma of zero, and that the QCA uses a with-imputation estimate of MRP that includes its assumed value of imputation credits. The QCA then adjusts the independent expert estimates upwards to reflect the QCA's assumed value of imputation credits:

> Without an adjustment, the survey evidence [including independent expert reports] supports a median market risk premium estimate of 6.0%. With an adjustment, the survey evidence [including independent expert reports] supports an estimate of 6.8%.
>
> Overall, our analysis shows that both surveys and independent expert reports support a median market risk premium estimate of 6.0% (excluding imputation credits) and a median estimate of 6.8% (including imputation credits).[96]

165. IPART also makes an *upward* adjustment. Based on IPART's most recent parameter estimates, it estimates the with-imputation required return on equity by increasing its ex-imputation estimate by 11%. IPART explain that:

> This approach uses the following equation, which shows the relationship between the return on equity including and excluding the benefits of imputation credits given our assumed tax rate (T) and gamma (γ):
>
> $$Return\,incl.\ imp\ benefits = Return\,excl.\ imp\ benefits \div \frac{1-T}{1-T(1-\gamma)}$$.[97]

166. In summary, we have:

a) A Grant Samuel estimate of 10.7% to 15.2% that does *not* include imputation credits because Grant Samuel are of the view that imputation credits do not affect the value of firms;

b) An ERA estimate that is 8.45% for the next five years, but which is expected to eventually revert to an estimate of 10.9% over time – where both of these figures *include* the ERA's (material) assumed value of imputation credits; and

[96] QCA (2014) UT4 Draft Decision, p. 232.
[97] IPART WACC Review (2013), p. 17.

c) The ERA's *ex-imputation* estimate of the required return on the market is 6.96%.

167. In our view, it is not reasonable or logical to interpret the Grant Samuel independent expert valuation report for Envestra as corroborating, or being in any way consistent with, the ERA's proposal that equity investors in the average firm currently require a return of only 8.45% including imputation credits and 6.96% without.

Previous submissions

168. In our previous submission to the ERA we addressed independent expert reports at some length.[98] In particular, we examined all independent expert reports since 2008 and noted that *none* of them adopt a required return that is as low as would be obtained by using the CAPM with a 5-year risk-free rate and 5.5% MRP.[99] We also addressed the relevance of the ERA's arguments about the possibility that it might allow higher returns at some time in the future.[100] These submissions have not been addressed in the ATCO Gas Draft Decision. We adhere to those submissions and repeat them by reference.

Conclusions on the use of independent expert reports

169. In our view, independent expert reports should be used to inform the reliability and reasonableness of an estimate of MRP. In our view, these reports provide relevant evidence which, if relegated to the final cross-check stage of the estimation process, is unlikely to ever receive any real weight.

170. Our assessment of the relevant evidence is that independent expert valuation reports support materially higher estimates of the required return on equity than those that would be produced by a mechanistic application of the Sharpe-Lintner CAPM. In particular, SFG (2013) and Incenta (2014) show that the return on equity estimates used in independent expert reports are materially higher than comparable regulatory estimates. An ex-imputation estimate of MRP of 6% (which we consider to be conservative for the reasons set out above and in our previous submission to the ERA) implies the with-imputation estimates of MRP and the required return on the market set out in Table 8 below.

Table 8
Current estimates from independent expert reports

	Theta=0.35 Gamma=0.25	Theta=0.7 Gamma=0.5
Required return on the market		
Risk-free rate of 2.95%	9.91%	10.87%
Risk-free rate of 3.58%	10.61%	11.63%
Market risk premium		
Risk-free rate of 2.95%	6.96%	7.92%
Risk-free rate of 3.58%	7.03%	8.05%

Source: RBA, Independent expert reports, SFG calculations.

Distilling a single estimate for the market risk premium

171. The estimates of the required return on the market and MRP from the various approaches are summarised in Table 9 and Figure 6 below.

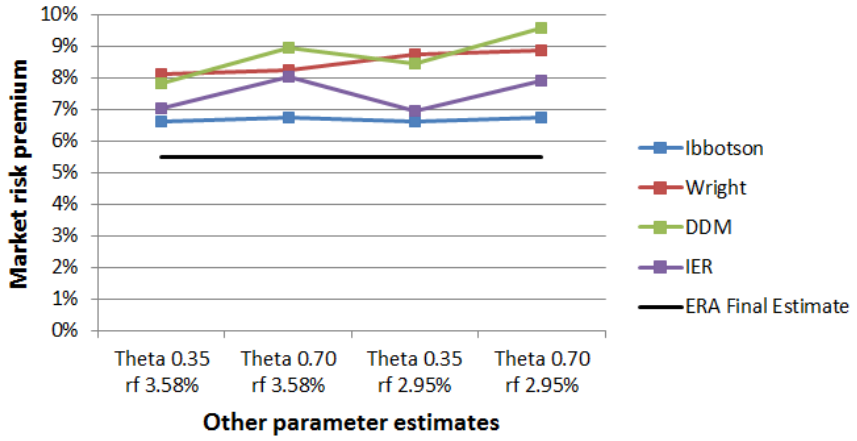
[98] SFG (2014 ERA), pp. 33-38.
[99] SFG (2014 ERA), pp. 33-35.
[100] SFG (2014 ERA), pp. 35-38.

Table 9
Current estimates of the required return on the market and the market risk premium

Method	Theta=0.35 r_f=3.58%	Theta=0.7 r_f=3.58%	Theta=0.35 r_f=2.95%	Theta=0.7 r_f=2.95%
Required return on the market				
Historical excess returns: Ibbotson	10.21%	10.34%	9.58%	9.71%
Historical excess returns: Wright	11.71%	11.83%	11.71%	11.83%
Dividend discount model	11.42%	12.53%	11.42%	12.53%
Independent expert valuation reports	10.61%	11.63%	9.91%	10.87%
Market risk premium				
Historical excess returns: Ibbotson	6.63%	6.76%	6.63%	6.76%
Historical excess returns: Wright	8.13%	8.25%	8.76%	8.88%
Dividend discount model	7.84%	8.95%	8.47%	9.58%
Independent expert valuation reports	7.03%	8.05%	6.96%	7.92%

This table sets out estimates of the required return on the market and MRP for two different estimates in relation to the value of imputation credits (theta 0.35/gamma 0.25 and theta 0.70/gamma 0.50) and two different estimates of the risk-free rate (5-year yield of 2.95% and 10-year yield of 3.58%).

Figure 6
Market risk premium estimates



172. In our view, the approaches set out in Table 9 have different relative strengths and weaknesses:

a) The Wright and Ibbotson approaches each represent end points of a spectrum when using historical data to estimate the required return on the market. The Wright approach assumes that the real required return on equity is constant across different market conditions and the Ibbotson approach assumes that the MRP is constant so that the required return on equity rises and falls directly with changes in the risk-free rate. We agree with the conclusion in the Guideline materials that there is no compelling statistical evidence to support one or the other of these assumptions and that regard should be had to both. We also note that both approaches are used in practice, including regulatory practice. We also note that it is common in practice to have some regard to long-run historical data when estimating the required return on the market.

b) We agree that dividend discount model evidence is relevant and should be considered when estimating the required return on the market. The dividend discount model is theoretically sound in that simply it equates the present value of future dividends to the current stock price and it is commonly used for the purpose of estimating the required return on the market. This approach is also the only approach that provides a forward-looking estimate of MRP.

c) Independent expert valuation reports provide an indication of the required return on equity that is being used in the market for equity funds. In our view, this information is relevant and should be considered. However, we note that certain assumptions must be made when seeking to extract an appropriate MRP estimate from an independent expert report (in particular, the extent to which various uplift factors should be incorporated into the MRP estimate). It is for this reason that we adopt a conservative ex-imputation MRP estimate of 6% in this report.

173. Taking account of the relevant strengths and weaknesses of the different estimation approaches, we propose the weighting scheme set out in Table 10 below. Our reasons for proposing this weighting scheme are as follows:

a) We apply 50% weight to the forward-looking dividend discount model estimate and 50% weight to the approaches that are based on historical data. The historical estimates are based on a larger amount of data and are therefore more statistically precise, however the forward-looking estimates are more relevant to the prevailing conditions in the market. We consider both statistical precision and relevance to the prevailing conditions as being equally important considerations, so we apply 50% weight to each approach;

b) When allocating the 50% weight that we apply to the estimates based on historical data, we apply equal weight to the Ibbotson and Wright approaches. These two approaches represent the two ends of the spectrum in relation to the processing of the historical data. The Ibbotson approach considers the MRP to be constant over time, whereas the Wright approach considers the MRP to be inversely related to the risk-free rate. There is no compelling statistical evidence to prefer one approach to the other, so we apply equal weight to these two methods of processing the historical excess returns data; and

c) We consider the independent expert estimates to be essentially backward-looking estimates given their stability over time and over different market conditions. We assign this estimate less weight than the Ibbotson and Wright approaches on the basis that the independent expert estimates are less transparent. For example, as described in SFG (2013 AER) the effective MRP may differ from the headline MRP in cases where the independent expert has added an uplift factor to their estimate of the required return. That is, independent experts rarely adopt, as their final estimate of the required return, the figure that results from inserting their headline MRP into the CAPM. The final figure is almost always higher than that, consistent with a higher *effective* MRP. In our calculations below, we have adopted a conservative estimate in that it is not influenced by any uplift factors or adjustments to the historically low risk-free rate.

Table 10
Weightings for the required return on the market and MRP

Method	Weighting
Historical returns (Ibbotson)	20%
Historical returns (Wright)	20%
Dividend discount model	50%
Independent expert valuation reports	10%
Weighted average	100%

174. Applying these weights to the various estimates produces the final weighted-average estimates set out in Table 11 below.

Table 11
Weighted-average estimates of the required return on the market and the market risk premium

Method	Theta=0.35 r_f=3.58%	Theta=0.7 r_f=3.58%	Theta=0.35 r_f=2.95%	Theta=0.7 r_f=2.95%
Required return on the market	11.19%	11.81%	11.03%	11.65%
Market risk premium	7.61%	8.23%	8.08%	8.70%

175. We note that the final estimates are relatively insensitive to the proposed weighting scheme. For example, the final MRP estimate changes by less than 10 basis points if:

a) If a weight of 25% was applied to each of the four estimates;

b) Equal weight is applied to the Ibbotson and Wright approaches only; or

c) Equal weight is applied to the Ibbotson, Wright and dividend discount approaches only.

176. Our preferred estimate of gamma is 0.25, our preferred estimate of theta is 0.35, and our preferred estimate of the risk-free rate is 3.58% based on the yield on 10-year government bonds. Consequently, our preferred estimate of the required return on the market is 11.19%, which corresponds to a contemporaneous estimate of the MRP of 7.61%. In our view, these estimates are commensurate with the prevailing conditions in the market for equity funds.

Conclusions in relation to the market risk premium

177. In our view, the ERA's 5.5% estimate for the MRP is based on a number of errors as follows:

a) The ERA has improperly used indicator variables relative to their *historical ranges* to select a point estimate from within its *current range* for MRP. This approach has no logical basis to it. The appropriate way to have regard to indicator variables is set out in IPART (2013);

b) The ERA's estimate of MRP includes the assumed value of imputation credits. Since its Guideline, the ERA has materially increased its assumed value of imputation credits but has neglected to revise its MRP estimates in accordance with its new estimate for gamma;

c) In relation to the Ibbotson historical returns approach, the ERA has failed to use the most recently available data and has failed to correct the available data for known inaccuracies;

d) In relation to the Wright historical returns approach, the ERA states that the approach should be used, but never calculates an estimate for it;

e) We note that the dividend discount approach produces an estimate of the required return on the market, from which the risk-free rate is subtracted. By contrast, the ERA has interpreted the dividend discount approach as though it produces a direct estimate of MRP, which is independent of the risk-free rate. In our view, this is a clear error that results in the ERA adopting a dividend discount estimate of MRP that is clearly inconsistent with the evidence on which the ERA relies;

f) In relation to use of independent expert reports, the ERA has erroneously compared its own *with-imputation* estimate of MRP with an independent expert *ex-imputation* estimate of MRP. The ERA also erroneously compares its own estimate of *future* MRP allowances with independent expert estimates of the *current* MRP. These inappropriate comparisons lead the

ERA to conclude that its own estimate of MRP is consistent with the independent expert estimate when it is clearly not.

178. In our view, the best estimate possible in the circumstances of the MRP is obtained by:

a) Correcting the errors set out above; and

b) Having regard to the Ibbotson and Wright approaches in relation to historical excess returns, the dividend discount approach, and independent expert reports.

179. We set out reasons for our proposed weighting of the four approaches for estimating MRP, and we note that the final estimate is not materially sensitive to the selection of a range of other reasonable weighting schemes. Our proposed estimate of 7.61% is materially different from the ERA's estimate of 5.5%, which we consider to have been contaminated by the errors listed above. The ERA's materially different estimate of MRP will lead to a materially different allowed return on equity when inserted into the CAPM.

180. As set out above, we note that the AEMC has explicitly stated that achieving the National Gas Objective (NGO) and Revenue and Pricing Principles (RPP) requires the best estimate possible in the circumstances of the benchmark efficient financing costs, an important component of which is the required return on equity. For the reasons set out above, our view is that the ERA's current estimate of MRP is not the best estimate possible in the circumstances. It then follows that the ERA has not produced "the best possible estimate of the benchmark efficient financing costs" as required by the AEMC above and in the Allowed Rate of Return Objective. It also follows, as set out by the AEMC above, that the ERA's allowed return will not achieve the NGO or RPP in terms of promoting "efficient investment in…natural gas services…for the long term interests of consumers."[101] An allowed return on equity that is materially below the efficient financing costs of the benchmark efficient entity will create incentives for under investment, which is not in the long-term interests of consumers.

181. Similarly, the RPP require that "regard should be had to the economic costs and risks of the potential for under and over investment" [102] and that "a reference tariff should allow for a return commensurate with the regulatory and commercial risks involved."[103] It is difficult to see how these principles can be complied with if the allowed return does not reflect the best possible estimate of the efficient financing costs of the benchmark efficient entity.

182. The RPP also require that "a service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs,"[104] which would seem to require that the allowed return must be at least commensurate with the efficient financing costs of the benchmark efficient entity.

183. For all of the reasons set out above, our view is that the ERA's estimate of MRP is based on a number of errors and that correction of those errors would lead to a materially preferable estimate of the allowed return on equity that is more consistent with the ARORO, NGO and RPP.

[101] National Gas Law, s. 23.
[102] National Gas Law, s. 24(6).
[103] National Gas Law, s. 24(5).
[104] National Gas Law, s. 24(2).

4. The risk-free rate

The key point of difference

184. In our view, it is appropriate to estimate the risk-free rate as the contemporaneous yield on 10-year government bonds. In its ATCO Gas Draft Decision, the ERA proposes to estimate the risk-free rate as the contemporaneous yield on 5-year government bonds.

Commercial practice is to use a long-term risk-free rate

185. There is broad agreement that the dominant practice of market practitioners and valuation professionals is to set the term of the risk-free rate to 10-years on the basis that this is the longest observable term for Australian government bonds. For example, SFG (2013 IER) note that the overwhelming majority (94%) of expert assessments in their 2012/13 sample group employed a term assumption for the risk-free rate of ten years. Several reports indicated that the use of a 10-year term assumption was standard practice amongst independent experts in Australia. For example, in its report to ING Real Estate Community Living Group, Deloitte stated that:

> The 10-year bond rate is a widely used and accepted benchmark for the risk free rate in Australia.[105]

186. In its report for Hastings Diversified Utilities Fund (a firm with regulated infrastructure investments), Grant Samuel noted that:

> The ten year bond rate is a widely used and accepted benchmark for the risk free rate. Where the forecast period exceeds ten years, an issue arises as to the appropriate bond to use. While longer term bond rates are available, the ten year bond market is the deepest long term bond market in Australia and is a widely used and recognised benchmark. There is a limited market for bonds of more than ten years. In the United States, there are deeper markets for longer term bonds. The 30 year bond rate is a widely used benchmark. However, long term rates accentuate the distortions of the yield curve on cash flows in early years. In any event, a single long term bond rate matching the term of the cash flows is no more theoretically correct than using a ten year rate. More importantly, the ten year rate is the standard benchmark used in practice.[106]

187. In summary, the independent expert evidence supports the use of a 10-year term to maturity when estimating the risk-free rate:

    a) 94% of the relevant reports adopted a 10-year term assumption; and

    b) The few reports that did not use a 10-year term assumption explained that the reason for not doing so was that they were adopting a term assumption that matched the lives of the assets being valued.

188. Incenta (2013) also conclude that the dominant commercial practice is to use a 10-year term for the risk-free rate:

> 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

[105] Deloitte (2012), ING Real Estate Community Living Group – Independent expert's report and Financial Services Guide, 24 April 2012, p.93.
[106] Grant Samuel (2012), Hastings Diversified Utilities Fund – Independent Expert's report, 3 August 2012, p.4.

> premium…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. [107]

189. In its ATCO Gas Draft Decision, the ERA accepts that the evidence establishes that the overwhelming commercial practice is to set the term of the risk-free rate to 10 years, but argues that this evidence is not relevant to the regulatory task.[108]

The role of the regulator

Should the regulator seek to produce commercial outcomes?

190. In its Guideline Explanatory Statement, the ERA notes that the commercial practice is to set the term of the risk-free rate to 10 years, but suggests that the regulatory task is different. In particular, the ERA states that it does not consider the regulatory role to be one of replicating the returns that commercial investors would require from assets such as the one being regulated. Specifically, the ERA states that its role is *not* to estimate the return that investors would use when estimating the value of the regulated asset:

> the Authority considers that equity analysts are generally trying to estimate the value of the company…In that case it would be reasonable to utilise the longest possible term risk free rate to contribute to the discount rate to be applied to those cash flows. However, that is not the regulatory task, which involves determining rate of return for a five year period.[109]

191. This reasoning leads the ERA to conclude that the evidence that commercial investment proceeds on the basis of a 10-year risk-free rate is not relevant to its regulatory task.[110] The ERA goes on to conclude that it should not be seeking to replicate the commercial return that would be required by investors when investing in an asset with a similar degree of risk to the asset that is being regulated. The ERA concludes that its role is *not* even to estimate the return that investors would use when valuing the regulated asset itself.

192. The ERA reaches this conclusion notwithstanding the Allowed Rate of Return Objective, which states that:

> [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 applies to the [Service Provider] in respect of the provision of [services].[111]

193. Moreover, the standard economic interpretation of the requirement to have regard to:

> the prevailing conditions in the market for equity funds.[112]

[107] Incenta (2013), p. 13.
[108] ERA ATCO Gas Draft Decision, p. 149, Paragraphs 642-643.
[109] ERA Rate of Return Guideline Explanatory Statement, p. 89, Paragraph 465.
[110] ERA ATCO Gas Draft Decision, p. 149, Paragraph 643.
[111] For example, see NGR 87(2)(3).
[112] For example, see NGR 87(7).

would include some consideration of the return that investors would use when valuing the regulated asset.

194. However, the ERA reaches a different view, based primarily on its NPV=0 principle. This has led the ERA to align the term of the risk-free rate with the length of the regulatory period.

195. However, as set out in more detail below, it is important to note that the NPV=0 principle only implies that the term of the discount rate should match the length of the regulatory period *if* the end-of-period asset value is known with 100% certainty from the beginning of the period. Otherwise, the NPV=0 principle implies that a long-term discount rate should be adopted, consistent with the standard commercial practice.

196. That is, the NPV=0 principle does not require that the term of the risk-free rate must be aligned to the term of the regulatory period in *all* cases – only in the special case where the end-of-period asset value is known with 100% certainty from the beginning of the period. We explain this point in some detail in the next section of this report.

Implications for allocative efficiency

197. We now consider the case where a regulator aligns the term of the risk-free rate with the term of the regulatory period on the basis of the regulator's belief that the end-of-period market value of the asset *is* known with 100% certainty – but where investors do not believe that the market value of the asset is guaranteed, but is uncertain. In this case, investors will assess their required return using a long-term risk-free rate (consistent with their standard commercial practice) whereas the regulator will set the allowed return on the basis of the (generally lower) shorter-term risk-free rate.

198. In our view, setting the allowed return on regulated assets below the return that investors expect to receive on comparable assets in a commercial setting has clear implications for allocative efficiency. Setting the allowed return below the investor's required return will act as a disincentive for investment and result in allocative inefficiency.

199. Consequently, one consideration that is relevant to the question of economic efficiency is whether investors do consider the end-of-period market value of the asset to be guaranteed, such that a short-term risk-free rate would be appropriate. However, we note that there is no evidence to support the notion that investors consider the end-of-period asset value to be guaranteed. Rather, for example, the practice of independent experts and equity research analysts is to use a long-term risk-free rate when valuing regulated assets – the same approach that they apply to unregulated assets.

200. Also, consider the investors that are now preparing to bid on the regulated assets to be offered for sale by the Queensland and NSW governments. The suggestion that those bidders would use materially lower discount rates if the term of the regulatory period were shortened is fanciful. One of their main concerns is regulatory due diligence, and it is certainly not the case that they consider more frequent involvement of regulators as something that would *decrease* risk and their required return.

201. In our view, setting the allowed return on regulated assets below the return that investors expect to receive on comparable assets in a commercial setting has clear implications for allocative efficiency. Suppose a regulator believes that their regulatory process de-risks an investment such that the required return should be commensurately low. If investors do not share the regulator's views about the extent to which the regulatory process de-risks the asset, the lower allowed return will act as a disincentive for investment and allocative inefficiency.

202. In this setting, it is hard to imagine that the lower regulatory return could be considered to be "commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree

of risk" [113] or that it would "promote efficient investment in…natural gas services…for the long term interests of consumers."[114]

Implications for price volatility

203. In its ATCO Gas Draft Decision, the ERA states that it expects that its returns based on 5-year inputs will approximate returns based on 10-year inputs – on average over time. That is, the ERA's view is that, in the long run, the average return to investors and the average prices for consumers will be approximately the same whether returns are calculated on the basis of 5-year or 10-year inputs. The ERA also recognises that returns based on 10-year inputs will be less volatile:

> A 10 year view tends to 'smooth' out the large, but infrequent spikes in expected risk premia that are more evident in shorter investment horizons. The implication is that risk premia under a 5 year approach are generally lower than the 10 year average, for much of the time. However, the 5 year estimates are more volatile than the 10 year estimates, as they are more sensitive to fluctuations in prevailing market conditions. Over time, the average of the many 5 year observations should converge toward the average risk premium observed under a 10 year approach. [115]

204. That is, the ERA's view is that its approach will result in more volatility in regulated prices, without any material change in average prices.

205. Again, it is wrong to conclude that more volatility in regulated prices would "promote efficient investment in…natural gas services" [116] or that it would be in "the long term interests of consumers."[117]

The "present value principle"

What does NPV=0 mean?

206. In its ATCO Gas Draft Decision, the ERA concludes that when estimating the risk free rate component of the regulated rate of return:

> The Authority considers that a 5-year term for the risk free rate is consistent with the 'present value principle', and with investors' horizons with regard to the regulated assets, given the 5-year regulatory period. [118]

207. The basis for the position of the ERA is that aligning the term of the risk-free rate with the term of the regulatory period means that the net present value of expected cash flows to a regulated entity is equal to the regulated asset base. The ERA refers to this as the NPV=0 principle.

208. We agree that it is appropriate to estimate prices such that the present value of expected cash flows is equal to the asset value. However, we agree with Incenta (2013) in 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.[119]

[113] For example, see NGR 87(2)(3).
[114] National Gas Law, s. 23.
[115] ERA Rate of Return Guideline Explanatory Statement, p. 175, Paragraph 773.
[116] National Gas Law, s. 23.
[117] National Gas Law, s. 23.
[118] ERA ATCO Gas Draft Decision, p. 161, Paragraph 699.

209. That is, the NPV=0 principle does not say that the term of the risk-free rate must be equal to the length of the regulatory period. Rather, the NPV=0 principle says that the term of the risk-free rate should be appropriate for the cash flows that are being considered by investors.

210. The ERA says that investors need only consider the cash flows through to the end of the regulatory period because the end-of-period market value of the regulated asset is known with 100% certainty from the outset – thus, there is no need to consider any subsequent cash flows. In this regard, the ERA states that:

> the Authority notes that the value of the regulatory asset base, the risk free component of the return on equity, and the equity risk premium are set at the start of each regulatory period. This provides relative certainty with regard to the related earnings cash flow over the regulatory period, all other things equal. [120]

211. If it were true that the market value of the regulated asset *was* known with certainty from the outset, it does follow that investors could value the asset with reference to the cash flows over the regulatory period. There would be no need to consider cash flows beyond the regulatory period if the end-of-period market value of the asset was already known with certainty. However, we consider that the end of period market value of the assets is *not* certain, and that investors will consider *all* cash flows that the asset might generate over its life (as is the case with all other assets).

Key assumptions and their implications

212. In its ATCO Gas Draft Decision, the ERA sets out its view that the only way in which the NPV=0 principle is satisfied is if the term to maturity of the risk-free rate proxy is set equal to the term of the regulatory period. In our previous submission to the ERA, we documented that the ERA approach is based on the important assumption that there is no uncertainty about the market value of the regulated asset at the end of the regulatory period, and that assumption does not hold.[121]

213. The difference between the view of the ERA and our view can be summarised as follows. We consider that there *is* uncertainty over the market value of the asset at the end of the first regulatory period. In our view, the market value of the asset at the end of the first regulatory period will be the present value of the expected cash flows to be received after the first regulatory period. That is, at the end of the regulatory period, investors will estimate the future cash flows they expect the asset to produce and they will discount those expected cash flows back to a present value using a discount rate that reflects the prevailing conditions in the market at that time. This is how the market value of the asset at the end of the regulatory period will be determined.

214. That is, if at the end of the regulatory period, investors were forecasting higher cash flows and if market conditions were such that a lower discount rate was appropriate, the market value of the asset would be higher. Conversely, if investors were forecasting lower cash flows and if market conditions were such that a higher discount rate was appropriate, the market value of the asset would be lower. Since we don't know which of these will happen, or whether something different again might happen, there is uncertainty over what the market value of the assets will be at the end of the regulatory period.

215. Now consider an investor seeking to value the regulated asset at the beginning of the regulatory period:

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[119] Incenta (2013), p. 6.
[120] ERA ATCO Gas Draft Decision, p. 146, Paragraph 631.
[121] SFG (2014 ERA), Paragraphs 346-358.

a) If the investor considered that they knew with certainty what the market value of the regulated asset would be at the end of the regulatory period, they would value the asset as the present value of the cash flows during the regulatory period plus the present value of the certain end-of-period asset value; however

b) If the investor considered that the end-of-period market value of the regulated asset was uncertain, they would value the asset as the present value of the cash flows during the regulatory period plus the present value of their estimate of the end-of-period asset value. As set out above, the end-of-period market value of the asset would be estimated as the present value of all subsequent cash flows. In other words, the asset would be valued as the sum of the present values of all of the future cash flows that the asset is expected to generate. This is the standard approach that is used for valuing infrastructure assets, including regulated infrastructure assets.

216. The ERA view is that there is no uncertainty over the market value of the asset at the end of the first regulatory period, in which case the former of the two approaches set out above could be used when valuing the asset. This point is made clear in the Guideline Explanatory Statement where the ERA responds to the Incenta submission that:

> ...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. [122]

by stating that the above submission is flawed because it assumes that the end-of-period market value of the regulated asset is risky when, in fact, it is not:

> the Authority notes in this context that Incenta states that market practitioners view the residual value of asset as being risky. However, the Authority considers that the fact that the regulatory asset base is not re-valued periodically undermines this view, implying a very low risk for the full return of the value of the regulatory asset base. This provides strong support for the present value principle as it is interpreted by the Authority.[123]

217. The ERA confirms this view in its ATCO Gas Draft Decision as follows:

> the Authority notes that the value of the regulatory asset base, the risk free component of the return on equity, and the equity risk premium are set at the start of each regulatory period. This provides relative certainty with regard to the related earnings cash flow over the regulatory period.[124]

218. The ERA's approach to the term of the risk-free rate and to the NPV=0 principle is based on the work of Lally.[125] In his most recent contribution on this issue, Lally (2012 AER) is very clear about the assumption that serves as the foundation for all of his derivations. He assumes that the regulatory process is such that the market value of the regulated assets at the end of each regulatory period is not subject to any risk:

[122] ERA Rate of Return Guideline Explanatory Statement, p. 89, Paragraph 462.
[123] ERA Rate of Return Guideline Explanatory Statement, p. 89, Paragraph 464.
[124] ERA ATCO Gas Draft Decision, p. 146, Paragraph 631.
[125] ERA Rate of Return Guideline Explanatory Statement, Appendix 2.

> the output price will be reset to ensure that the value at that time of the subsequent payoffs on the regulatory assets equals the regulatory asset book value prevailing at that time[126]

such that the:

> payoffs at time 4 [the end of the regulatory period in his example] are certain.[127]

219. In summary, the assumption that the value of the asset at the end of the regulatory period is already known with 100% certainty at the beginning of the regulatory period is the basis for the derivation of the conclusion that the NPV=0 principle requires the term of the risk-free rate to be set to the length of the regulatory period. If the market value of the asset at the end of the regulatory period is *not* known with certainty, setting the term of the risk-free rate equal to the length of the regulatory period is no longer consistent with the NPV=0 principle.

220. Thus, the key point has been crystallised:

a) If the market value[128] of the asset at the end of the regulatory period *is* known with certainty right from the start of the regulatory period, setting the term of the risk-free rate equal to the term of the regulatory period will be consistent with the NPV=0 principle – because the asset can be valued with reference to cash flows over the regulatory period only; and

b) If the market value of the asset at the end of the regulatory period is *not* known with certainty right from the start of the regulatory period, setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle – because the asset would be valued with reference to cash flows extending beyond the end of the regulatory period.

The end-of-period market value is either certain or it is not

221. There appears to be general agreement between ourselves, Lally and the ERA about the fact that the Lally/ERA derivation of the NPV=0 principle requiring a short-term risk-free rate, relies on the end-of-period market value of the asset being certain from the outset. The reasons why the end-of-period asset value might not be known with certainty are irrelevant – if it is *not* known with certainty right from the start of the regulatory period, the derivation does not hold and setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle.

222. In this context, the only thing that potentially differentiates a regulated company from an unregulated one is the possibility that the regulated firm might have a known market value at the end of the regulatory period whereas a commercial firm does not. If the end-of-period market value of the regulated firm *is* known with certainty from the outset, there is an argument for aligning the term of the risk-free rate to the length of the regulatory period. If the end-of-period market value is *not* guaranteed, the regulated firm is not materially different from the unregulated firm and would be valued in the same way – as the present value of all future expected cash flows. In this case, the regulated firm should use the same long-term risk-free rate that is used by the comparable

[126] Lally (2012 AER), p. 14.
[127] Lally (2012 AER), p. 10.
[128] To be clear, we reiterate that it is the end-of-period *market* value of the asset that must be known with certainty, not the end-of-period RAB. The RAB is not a value, it is an input into a regulatory formula that determines the allowed price. Lally (2013 QCA) is very clear about this point in his worked example where the RAB is obviously known from the outset and he shows that a certain end-of-period market value is required before the term can be set to the length of the regulatory period.

commercial firms. Indeed, in commercial practice this is precisely how regulated firms are valued – as the present value of all future cash flows, using a discount rate based on the 10-yeare risk-free rate.

223. In summary, the end-of-period market value of the asset is either known with 100% certainty or it is not. If not, there is no basis for using the NPV=0 principle as the basis for requiring that the term of the risk-free rate is set to the term of the regulatory period.

224. Our point is that it is not appropriate to assume that the asset base has a certain value at the end of the regulatory period. Because there is risk associated with the market value at the end of the regulatory period, the cost of capital reflects expectations for all future cash flows. And once the asset is valued using all future cash flows a long-term risk-free rate must be used.

Potential regulatory responses

225. The foregoing discussion can be summarised as follows:

a) If the value of the asset at the end of the regulatory period *is* known with certainty right from the start of the regulatory period, setting the term of the risk-free rate equal to the term of the regulatory period will be consistent with the NPV=0 principle; and

b) If the value of the asset at the end of the regulatory period is *not* known with certainty right from the start of the regulatory period, *for whatever reason*, setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle.

226. If a regulator argues that the derivation of the NPV=0 principle does not require that the end-of-period asset value must be known with 100% certainty right from the beginning of the period, they would be demonstrably wrong. The mathematical proof from Lally establishes this point.

227. Consequently, we assume that the regulator accepts that the NPV=0 principle requires that the end-of-period asset value must be known with 100% certainty, as the AER and IPART have done. In this case, the NPV=0 principle would only be relevant if the regulator considered that the end-of-period asset market value *was* known with 100% certainty. This would be the case, for example, if the regulator considered that its regulatory process was such that it could guarantee that at every regulatory determination it would set allowed revenues such as to *exactly* compensate investors for every one of the building block components. This appears to be the view of the ERA, as set out above.

228. If a regulator really did believe that its regulatory process guaranteed the end-of-period market value of the asset with 100% certainty, the regulator should nominate that value in advance in its regulatory determination. Investment decisions would then be improved by that certainty.

Conclusion on the present value principle

229. For the reasons set out above, our view is that:

a) The market value of the regulated asset at the end of the regulatory period is not certain right from the beginning of the regulatory period;

b) Consequently, setting the term of the risk-free rate equal to the term of the regulatory period is not required by the NPV=0 principle and will *not* be consistent with the NPV=0 principle; and

c) A long-term risk-free rate should be used, which is consistent with:

i) The long-term (uncertain) cash flows that determine the value of the asset; and

ii) Commercial practice.

Consistency between the risk-free rate and the market risk premium

The current practice of the ERA

230. In the CAPM, the market risk premium represents the extent to which the expected return on the market portfolio exceeds the risk-free rate:

$$r_e = r_f + \beta(r_m - r_f).$$

231. In its ATCO Gas Draft Decision, the ERA has adopted an estimate of the market risk premium of 5.5%. This estimate is selected from within a range that is formed on the basis of historical market returns and dividend discount models, all estimated by consultants and other regulators.[129]

232. Both sources of data estimate the MRP relative to the yield on 10-year government bonds. This is because the estimates were performed for other regulators who set the term of the risk-free rate to 10 years and because a long-term history of 5-year government bond yields is not available.

233. That is, the ERA adopts a market risk premium, relative to the yield on 10-year government bonds, of 5.5%.[130] The yield on 10-year government bonds at the time of the ATCO Gas Draft Decision was 3.5%.[131] Together, these figures imply a required market return of 9%.

234. But the ERA then implements the Sharpe-Lintner CAPM using its fixed 5.5% MRP (which has been estimated relative to 10-year government bond yields) and an estimate of the five-year risk-free rate of 2.95%.[132] This implies an estimate of the required return for the average firm of:

$$\begin{aligned} r_e &= r_f + \beta(r_m - r_f) \\ &= 2.95\% + 1(9\% - 3.5\%) = 8.4\%. \end{aligned}$$

235. That is, having determined that the required return for the average firm is 9%, the ERA then sets the allowed return for ATCO Gas as though the required return for the average firm is only 8.4%. It uses a risk-free rate of 2.95% in one place, and a risk-free rate of 3.5% in another place – within the same CAPM formula.

GasNet inconsistency

236. In explaining its reasons for adopting a 10-year term for the risk-free rate, the AER recently had regard to the *GasNet* decision of the Australian Competition Tribunal:

> The Australian Competition Tribunal (the Tribunal) decided in its 2003 GasNet decision that 10 years is the appropriate term of the risk free rate in the CAPM. The Tribunal came to this view on the basis of two reasons:

[129] ERA ATCO GAS Draft Decision, p. 161, Paragraph 702.
[130] We note that we do not agree that this is a reasonable estimate of MRP. However, the point being made here concerns the internal inconsistency of the ERA's estimation process, rather than the absolute value of the ERA's estimates.
[131] As at 9 September, 2014. Source: RBA.
[132] ERA ATCO Gas Draft Decision, p. 161, Paragraph 700.

> • as the MRP was estimated using a 10 year risk free rate, consistency demands that a 10 year risk free rate be used in the CAPM, and
>
> • it is a convention of economists and regulators to use a relatively long-term risk free rate where the life of the assets is relatively long.[133]

237. In its GasNet decision, the Tribunal stated that:

> The position of the ACCC was that it was required to make an evaluative judgment for the purposes of s 8.30 as to what the appropriate Rate of Return should be. Its position was that although consistency was desirable, best estimates have to be used when perfect information is not available, and that at various stages of the CAPM, approximations and estimates are required. The ACCC contends that such a use of estimates and approximations does not invalidate the use of the CAPM. While it is no doubt true that the CAPM permits some flexibility in the choice of the inputs required by the model, it nevertheless requires that one remain true to the mathematical logic underlying the CAPM formula. In the present case, **that requires a consistent use of the value of r_f in both parts of the CAPM equation where it occurs** so that the choice was either a five year bond rate or a ten year bond rate in both situations.[134]

238. The Tribunal went on to conclude that:

> The ACCC erred in concluding that it was open to it to apply the CAPM in other than the conventional way to produce an outcome which it believed better achieved the objectives of s 8.1. In truth and reality, **the use of different values for a risk free rate in the working out of a Rate of Return by the CAPM formula is neither true to the formula nor a conventional use of the CAPM**. It is the use of another model based on the CAPM with adjustments made on a pragmatic basis to achieve an outcome which reflects an attempt to modify the model to one which operates by reference to the regulatory period of five years. The CAPM is not a model which is intended to operate in this way. **The timescales are dictated by the relevant underlying facts in each case and for present purposes those include the life of the assets and the term of the investment**. [135]

239. In summary, the practice of the ERA in using the 10-year yield to estimate the risk-free rate in one part of the CAPM formula, and the 5-year yield to estimate the risk-free rate in another part of the same CAPM formula is inconsistent with the Tribunal's *GasNet* ruling.

The internal inconsistency in the ERA approach

240. During the ERA's Guideline process, a number of stakeholders raised the GasNet inconsistency issue – the fact that the ERA inputs two different estimates of the risk-free rate within the same CAPM formula. In responding to GGT's submission on this point, the ERA stated that:

> The Authority does not agree with GGT's assertion that an inconsistency exists with respect to the MRP calculation. The Authority is of the view that the 5-year CGS risk free rate of return applied in the Sharp-Lintner CAPM on the left is the best available proxy for the forward looking estimate of the risk free rate, consistent with the regulatory

[133] AER Draft Rate of Return Guideline Explanatory Statement, p. 182.
[134] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6, Paragraph 46, emphasis added.
[135] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6, Paragraph 46, emphasis added.

> period and the investment horizon. However, there is no similar proxy for the forward looking MRP on the right.[136]

241. This response is self-contradictory – it begins by claiming that there is no inconsistency, and then goes on to explain why the ERA considers the obvious inconsistency to be acceptable. On the first point, if one considers that the use of two different estimates of the same parameter in the same formula to be "an inconsistency" then clearly there is an inconsistency in the ERA's approach.

242. The claim that the inconsistency is acceptable is based on the notion that:

a) The ERA believes that the risk-free rate is best estimated by the 5-year yield; but

b) The only estimates of the MRP that are available are relative to the 10-year yield.

243. This leads the ERA to conclude that it is somehow forced to use these inconsistent estimates in the same CAPM formula. Such an argument is unsustainable. If the MRP is estimated relative to the 10-year yield, all the ERA would have to do is to add the current 10-year yield to its estimate of the MRP to obtain an estimate of the required return on the market. Then the ERA could populate the CAPM formula using the same estimate of the risk-free rate in both places that it appears. For example, the simple internally consistent calculation would be:

$$\begin{aligned} r_e &= r_f + \beta\left(r_m - r_f\right) \\ &= 2.95\% + 1(9\% - 2.95\%) = 9\%. \end{aligned}$$

244. This is no more complex and involves no additional cost relative to the ERA's current approach. It does, however, satisfy the requirement in the Tribunal's *GasNet* decision that the terms be internally consistent.

Conclusion on internal consistency

245. In our view, the same estimate of the risk-free rate should be used in the two places it appears in the CAPM formula. In the CAPM, the central parameter is the required return on the market (or average firm). The required return on every firm pivots around the required return on the market, according to the beta of the firm. That is, the required return on the market is the anchor point for the CAPM. Suppose that, having determined the required return on the market, a regulator inserts two different risk-free rates into the CAPM equation. The result is that the CAPM will produce an (output) estimate of the required return of the average firm that is inconsistent with the regulator's (input) estimate of the required return of the average firm, as set out in Paragraphs 233 to 235 above. This implementation of the CAPM does not produce (output) estimates that are true to the regulator's own estimate of the key anchor point for the CAPM.

The best estimate of the term of the risk-free rate

A 10-year term is consistent with the long-term life of the asset and the cash flows

246. The basis of the Sharpe-Lintner CAPM is that the expected returns of any asset can be replicated by a portfolio of the risk-free asset and the market portfolio. For example, the expected returns of an asset with beta of 0.8 can be replicated by a portfolio of 20% in the risk-free asset and 80% in the market portfolio. The return on the market portfolio is driven by the assessment that investors make about the cash flows that that portfolio is expected to generate over a long horizon. Similarly, the

[136] ERA Rate of Return Guideline Explanatory Statement, p. 87, Paragraph 456.

returns on an individual company or asset are driven by the assessment that investors make about the cash flows that the company or asset is expected to generate over *its* long horizon. Consequently, a similarly long-horizon risk-free asset should be used for consistency.

247. In its ATCO Gas Draft Decision, the ERA cites a number of experts who recommend that a long-term risk-free rate should be used when evaluating long-lived assets that produce cash flows over the long term:

> … Pratt and Grabowski (2010) and Damodaran (2008) both propose that, in general, an equity investment in an ongoing business is long term. They suggest, therefore, that for an ongoing business, the term of the equity should be measured as the duration of the long-term—and potentially infinite—series of cash flows. Both conclude that it is appropriate to use long term government bonds to estimate the return on equity, with Damodaran suggesting that 10 years is generally appropriate.[137]

248. We note that this approach of adopting a long-term risk-free rate is recommended when implementing the CAPM for the purposes of corporate valuation and new project evaluation. For example, Copeland, Koller and Murrin (2000) state that, when implementing the CAPM:

> We recommend using a 10-year Treasury bond rate for several reasons. It is a long-term rate that usually comes close to matching the duration of the cash flow of the company being valued…The 10-year rate approximates the duration of the stock market index portfolio and its use is consistent with the betas and market risk premiums estimated relative to these market portfolios.[138]

249. Management consultants Stern Stewart also define that when implementing the CAPM:

> The company's cost of equity…is the risk-free rate prevailing on long-term government bonds plus the appropriately scaled [by beta] risk premium.[139]

250. The use of a long-term risk-free rate is also recommended for the regulatory setting. Morin (2006) sets out a number of reasons for using a long-term risk-free rate when determining the allowed returns for regulated utilities:

> To implement the CAPM methodology, an estimate of the risk-free rate of return is required. As a proxy for the risk-free rate, long-term rates are the relevant benchmarks when determining the cost of common equity. There are several reasons for this, both conceptual and practical.
>
> At the conceptual level, because common stock is a long-term investment and because the cash flows to investors in the form of dividends last indefinitely, the yield on long-term government bonds is the best measure of the risk-free rate for use in the CAPM….Utility asset investments generally have long-term useful lives and should be correspondingly matched with long-term maturity financing instruments.
>
> At the practical level, short-term rates are volatile, fluctuate widely, and are subject to more random disturbances than are long-term rates, leading to volatile and unreliable equity return estimates.[140]

[137] ERA ATCO Gas Draft Decision, pp. 147-148, Paragraph 637.
[138] Copeland, Koller and Murrin (2000), McKinsey Inc, p. 216.
[139] Stewart (1991), p. 442.

251. In our view, a long-term risk-free rate should be used when implementing the CAPM in relation to long-term infrastructure assets and this view is supported by the weight of expert opinion. Using a shorter period of 5 years would be an error.

A 10-year term is consistent with the practice of independent experts and with commercial practice

252. As set out in Paragraphs 185 to 189 above, the dominant market practice is to use a long-term risk-free rate when estimating required returns. There is general acceptance of this proposition.

A 10-year term is consistent with the practice of a number of Australian regulators

253. The current Australian regulatory practice is to use a ten-year term to maturity when estimating the risk-free rate. For example, in its recent Draft Rate of Return Guideline, the AER concluded that:

> On balance, we are more persuaded by the arguments for a 10 year term, than the arguments for a five year term.[141]

254. The AER also notes that the Australian Competition Tribunal advocates the use of a 10-year term, as set out above.

255. IPART, which has previously adopted a 5-year term to maturity, has recently announced that it will now adopt a 10-year term:

> We agree with stakeholder views that increasing the TTM [term to maturity] from 5 years to 10 years for all industries is more consistent with our objective for setting a WACC that reflects the efficient financing costs of a benchmark entity operating in a competitive market.[142]

Regulatory practice is to adopt a 10-year term because the end-of-period market value of the asset is not guaranteed.

256. As set out above, the AER has rejected the ERA approach of setting the term of the risk-free rate equal to the term of the regulatory period. The AER recognises that aligning the term of the risk-free rate to the term of the regulatory period is only justified in the case where the end-of-period market value of the asset is known with certainty from the outset:

> In Lally (2012), the argument for a five year term relies on the 'present value principle'—the principle that the net present value (NPV) of cash flows should equal the purchase price of the investment.
>
> Lally stated that the present value principle is approximately satisfied only if the term of equity matches the regulatory control period. Lally illustrated this point using a numerical example in which there is no risk, so the return on equity equals the risk free rate. The example sets allowed revenues at the beginning of the regulatory control period using the yield to maturity on a five year risk free bond. Lally showed that in this example, the 'present value principle' is approximately satisfied: the NPV of the cash flows is approximately equal to the book value of the assets.

[140] Morin (2006), pp. 151-152.
[141] AER Draft Rate of Return Guideline Explanatory Statement, p. 181.
[142] See IPART (2013), Review of WACC Methodology, December, p. 12.

> The reason why the principle is satisfied is that the structure of the bond payments and the structure of the regulatory payments are similar…The core intuition behind the argument for a five year term is that the cash flows from the building block model have a similar structure to the cash flows from a five year bond. Put simply, the argument is that an equity investment in a regulated business is—at least in respect of its term—like an investment in a five year bond.
>
> The central issue in the debate about the term of equity, therefore, is the extent to which the cash flows from an equity investment in a regulated business are like the cash flows from a five year bond.[143]

257. However, the AER goes on to note that the cash flows from an equity investment in a regulated business are *not* like the cash flows from a five year bond in a very important respect – whereas a bondholder receives a known payment at maturity, the infrastructure equity owner does not. Rather, infrastructure equity (like all equity) is risky and the value of shares five years into the future cannot possibly be known with certainty. Using the same Lally derivation on which the ERA now relies, the AER notes that this necessary precondition does not hold in practice, but only under certain theoretical assumptions:

> In Lally's calculation above, the cash flow in each year is the allowed revenue net of opex and capex, except in the final year, where the closing value of the regulatory asset base (RAB) is included in the cash flow. That is, the assumption is that the investor receives a cash payment equal to the RAB in the final year of the regulatory control period. While under certain assumptions, the market value of equity is equal to the residual value of the RAB, these assumptions may not hold in reality.[144]

258. The AER then cites a report by Incenta (2013) which explains that:

a) The argument that the term of the risk-free rate should be set equal to the length of the regulatory period relies on the end-of-period market value of the asset being known with certainty from the outset; and

b) Since this necessary precondition does not hold, the term of the risk-free rate should *not* be set to the length of the regulatory period:

> …investors are unlikely to evaluate regulated assets with reference to a 5 year bond because – unlike the case of the bond – the residual value at the end of each 5 year period is inherently risky. 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 changes and changes to customer preferences).[145]

259. The AER also notes that the same point has been made by Officer and Bishop (2008):

1.

> Officer and Bishop said that the argument for a five year term would be correct only if after five years, in the event that 'they [the owners of the regulated business] choose to walk away from the asset, they would be fully compensated'. Officer and Bishop propose, however, that the owners are not, in reality, guaranteed of such compensation—the

[143] AER Draft Rate of Return Guideline Explanatory Statement, p. 183.
[144] AER Draft Guideline, Explanatory Statement, p. 183.
[145] AER Draft Rate of Return Guideline Explanatory Statement, p. 183.

> problem is that there is no guarantee that the secondary market will deliver a price equal to the value of the equity component of the RAB. [146]

260. The AER concludes that the term of the risk-free rate should be set to 10 years and not to the length of the regulatory period. For the reasons set out above, our view is that the AER is correct in making this conclusion and it is an error to use a 5 year term.

Other issues raised by Incenta

261. In concluding that the term of the risk-free rate should be set to 10 years, the AER also cites two other points raised by Incenta. Incenta provided evidence (consistent with that set out above) that the commercial practice is to set the term of the risk-free rate to 10 years:

> First, Incenta presented the results of a survey of market practitioners which asks them whether they use a 10 year or a five year rate for valuing regulated equity. In this survey, 12 practitioners and two independent experts were asked specifically about 'the term of the risk free rate in a CAPM valuation of regulated infrastructure assets with a five year regulatory cycle'. All of those surveyed stated they used a 10 year rate. [147]

262. Incenta also advise that if the term of the risk-free rate was set to 5 years, the MRP would need to be re-estimated on a consistent basis:

> Second, Incenta observed that a move to a five year term for equity would have implications for our estimates of the MRP. For example, the evidence relating to historical estimates of the MRP have been calculated using a 10 year risk free rate. If we were to move to a five year term, this historical average may need to be recalculated (or approximated) using a five year risk free rate. The data we currently use to calculate historical averages of the MRP covers a significantly longer period than the data available for the five year risk free rate (which only extends back to the 1970s). [148]

263. The AER concludes that these "additional considerations support not adopting a five year term." The AER then confirms that it will maintain its use of a 10 year term. [149] We agree that consistency between the risk-free rate and MRP estimates is a necessary consideration, as set out above.

Conclusions on the risk-free rate

264. In our view, the ERA has erred in setting the term of the risk-free rate to 5 years in the following respects:

a) The commercial practice is to estimate the risk-free rate using the yield on 10-year government bonds. In the current market conditions, the ERA's regulatory estimate of the risk-free rate (based on 5-year government bonds) is a material 0.63% below the commercial estimate. The ERA accepts that its approach is materially different from the commercial practice, but justifies that difference by stating that the regulatory task is not based on estimating the returns that investors would require from a firm with similar risk.[150] However, our interpretation is that the ARORO requirement for the allowed return to be

[146] AER Draft Rate of Return Guideline Explanatory Statement, p. 183.
[147] AER Draft Rate of Return Guideline Explanatory Statement, p. 184.
[148] AER Draft Rate of Return Guideline Explanatory Statement, p. 184.
[149] AER Draft Rate of Return Guideline Explanatory Statement, p. 184.
[150] ERA Rate of Return Guideline Explanatory Statement, p. 89, Paragraph 465.

"commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk"[151] requires the regulator to have regard to the returns that investors would require from (and expect to earn from) comparable businesses;

b) The ERA has erred in its interpretation of the NPV=0 principle. By insisting that the NPV=0 principle requires the use of a 5-year risk-free rate, the ERA must either consider that:

   i) Its conclusion does not require that the market value of the regulated asset at the end of the regulated period is known with certainty from the beginning of the regulatory period; or

   ii) The end-of-period market value of the regulated asset actually is known with certainty from the beginning of the regulatory period,

   and neither of these assumptions are supportable;

c) The ERA uses two different estimates of the risk-free rate in the two places that parameter appears in the CAPM equation, which runs counter to the Tribunal's *GasNet* decision.[152]

265. In our view, all of the errors set out above are resolved by setting the term of the risk-free rate to ten years, consistent with commercial practice and the practice that is adopted for the vast majority of regulated assets in Australia.

266. In our view, the best estimate possible in the circumstances of the required return on equity involves setting the term of the risk-free rate to ten years. Our view is that making this correction would lead to a materially preferable estimate of the allowed return on equity that is more consistent with the ARORO, NGO and RPP. The 20-day average yield on 10-year government bonds was 5.58% as at 9 September 2014. That figure is used in the estimations throughout the balance of this report.

[151] For example, see NGR 87(2)(3).
[152] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6.

5. The use of other models to estimate the required return on equity

Dividend discount models

267. In our previous report, we proposed to apply some weight to dividend discount model estimates of the required return on equity for the benchmark firm. We note that in many regulatory jurisdictions (particularly in the United States) dividend discount models are the primary means of estimating the required return on equity for the regulated firm. We also noted that dividend discount models are commonly used in commercial practice when estimating the cost of capital and when valuing companies. Consequently, we considered dividend discount models to provide relevant evidence.

268. In its ATCO Gas Draft Decision, the ERA maintains the view set out in its Guideline that:

    a) Dividend discount models do provide relevant evidence about the required return on equity for the market (or average firm); but that

    b) Dividend discount models do not provide relevant evidence about the required return on equity for the benchmark firm. [153]

269. It has become common practice to use the terms "market" and "industry" to describe the two uses of dividend discount models set out above. That is, the ERA accepts the relevance of market dividend discount models, but not industry dividend discount models.

270. There is a range of industry dividend discount models, with variation in specification and implementation. In our previous report, we proposed a specification of the industry dividend discount model that is based on Fitzgerald, Gray, Hall and Jeyaraj (2013) – a paper that has been peer-reviewed and published in a very highly-ranked international journal.

271. In rejecting the use of industry dividend discount models for the purpose of estimating the required return on equity for the benchmark firm, the ATCO Gas Draft Decision identifies two points that were raised in the AER's Guideline. The first of these is that:

> the average estimated return on equity is consistently higher than that of the market over recent periods from 2006, even with real growth of dividends at zero; thus failing a basic 'sanity check'. [154]

272. As set out above, there is a range of industry dividend discount models with different specifications. The AER considers its own unique specification in which an individual firm's dividend growth rate is independent of how much of its profits are reinvested into the firm. That is, whether a firm reinvests all of its profits or none of its profits, dividends will grow at the same rate. The AER's model then effectively estimates the return for a firm as the sum of the dividend yield and the growth rate. Since all firms have the same growth rate in the AER's model, firms with higher dividend yields (such as electricity and gas distribution businesses) have higher estimates of the return on equity.

273. Even if it was appropriate to apply this "sanity check," it would not be appropriate to generalise beyond the AER's model. In particular, it is only the AER's specification of the industry dividend discount model that produces such a result due to its implausible assumption that future growth is entirely independent of the reinvestment rate. Our own specification of the industry dividend

[153] ERA ATCO Gas Draft Decision, pp. 158-159, Paragraphs 685-687.
[154] ERA ATCO Gas Draft Decision, p. 158, Paragraphs 686.

discount model does not produce this offending result, nor is it based on an implausible assumption.[155]

274. Moreover, the AER makes its own downward adjustment to produce an implausibly low long-run growth estimate for all firms. Consequently, even if one tests the AER model with lower growth rates for the benchmark industry, the fact that the AER has used implausibly low growth rates for other firms effectively guarantees the failure of its own sanity check.

275. In summary, it would be an error to rule that the SFG industry dividend discount model is irrelevant based on the outcomes of the (very different) AER model.

276. The second point raised in the ATCO Gas Draft Decision is the following:

> SFG Consulting's proposed DGM estimates for infrastructure business use analyst target prices, rather than the standard practice market price, and other non-standard approaches, potentially leading to upward bias in the estimate. [156]

277. Unfortunately, the ERA has this point backwards. The issue here is that dividend discount models rely, to some extent on analyst forecasts of future dividends. If there is any optimistic bias in those forecasts,[157] the implied discount rate will be too high. For this very reason, Fitzgerald, Gray, Hall and Jeyaraj (2013) compare analyst dividend forecasts with the target price for the same analyst – to neutralise any bias that may exist. On this point, the AER states that:

> In its argument for using target prices, SFG observes that there is some evidence that analysts' dividend forecasts are upward biased. To the extent that this is true, **our** DGM will overestimate the return on equity. [158]

278. That is, to the extent that this point is a material issue, the AER (correctly) notes that it will result in an upward bias to *its* estimate. The SFG approach provides a *lower* estimate of the required return by using target prices to neutralise any possibility of bias.

279. In summary, the ATCO Gas Draft Decision concludes that industry dividend discount models are irrelevant, and lists two reasons:

    a) The first applies to the AER specification but not the SFG specification, so would be a reason for rejecting the AER specification but not the SFG specification; and

    b) The ERA has the second reason around backwards – on this point, the AER specification would produce the higher estimate and the SFG approach would produce the lower estimate. To the extent that this point is an issue for the ERA, the SFG approach would produce a conservative estimate of the required return.

280. Consequently, it is our view that the ATCO Gas Draft Decision provides no proper basis for the rejection of dividend discount model estimates of the required return for the benchmark firm.

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[155] Moreover, the AER makes its own downward adjustment to produce an implausibly low long-run growth estimate for all firms. Consequently, even if one tests the AER model with lower growth rates for the benchmark industry, the fact that the AER has used implausibly low growth rates for other firms effectively guarantees the failure of its own sanity check.
[156] ERA ATCO Gas Draft Decision, p. 158, Paragraphs 686.
[157] That is, if analysts are forecasting higher dividends than are built into market prices.
[158] AER Rate of Return Guideline, Appendix E, p. 123, emphasis added.

281. We note that since our last submission to the ERA, we have prepared a submission to the AER (SFG 2014 DDM) that addresses all of the issues raised in its Guideline in relation to industry dividend discount models. That submission also updates our estimates using more recently available data. We attach that submission as an appendix to this report and we rely on the results reported in it to inform our estimate of the required return on equity for the benchmark firm.

The Fama French model

282. In our previous report, we proposed to apply some weight to the Fama French model when estimating the required return on equity for the benchmark firm. We noted that the Fama French model is becoming more and more integrated into mainstream finance practice in that it is discussed at some length in textbooks, it is part of the curriculum of professional accreditation courses, and it has been recognized by a Nobel Prize. Consequently, we considered the Fama French dividend discount models to provide relevant evidence.

283. In its ATCO Gas Draft Decision, the ERA maintains the view set out in its Guideline that the Fama French model is irrelevant, stating the following two reasons:

    a) "The FFM is dependent upon empirical justification"; and

    b) "The FFM risk premia are not systematically observed in the Australian market." [159]

284. On the first point, we note that the origins of the Fama-French model were in studies documenting the empirical failings of the CAPM. These studies documented that when the stock market index is used as the only factor the model does not fit the data, but when the additional Fama-French factors are included the model does fit the data. Logically, it would make no sense to maintain sole reliance on the CAPM due to the fact that alternative models were developed for the purpose of improving the very poor empirical performance of the CAPM.

285. Moreover, if that approach were adopted, it would be impossible to ever place weight on anything other than the CAPM – unless someone was to develop a model for reasons other than trying to accommodate some of the particular demonstrated empirical failings of the CAPM. This seems highly unlikely and would be inconsistent with the general form of scientific progression. Consider, for example, the evolution of models in astronomy that were set out in our previous submission.[160]

286. We note that since our last submission to the ERA, we have prepared a submission to the AER that addresses all of the issues raised in its Guideline in relation to the FFM. That submission deals at some length with the theoretical basis for the Fama-French model and compares it with the theoretical basis for the Sharpe-Lintner CAPM. We attach that submission as an appendix to this report in response to the ERA's claims about the theoretical basis of the FFM.

287. The second point raised in the ATCO Gas Draft Decision is that "the FFM risk premia are not systematically observed in the Australian market." [161] If it can be shown that the CAPM fits the Australian data better than the FFM, that would be a legitimate reason for preferring the CAPM to the FFM.[162] To date, the most comprehensive study on this exact question is Brailsford, Gaunt and O'Brien (2012). They use a long history of data that uses a range of electronic data bases supplemented with a large volume of data for smaller firms that has been hand-collected from historical annual reports.

[159] ERA ATCO Gas Draft Decision, p. 157, Paragraphs 680.
[160] SFG (2014 ERA), p. 18.
[161] ERA ATCO Gas Draft Decision, p. 157, Paragraphs 680.
[162] It is still not clear that this would establish that the FFM is irrelevant.

288. Brailsford, Gaunt and O'Brien (2012) report that:

> Our study provides two advances. Firstly, the study utilizes a purpose-built dataset spanning 25 years and 98% of all listed firms. Secondly, the study employs a more appropriate portfolio construction method than that employed in prior studies. With these advances, the study is more able to test the three-factor model against the capital asset-pricing model (CAPM). The findings support the superiority of the Fama–French model, and for the first time align the research in this area between Australia and the USA.[163]

289. The ERA cited the study by Brailsford, Gaunt and O'Brien (2012a) in its Guideline materials. The ERA notes that "[t]heir 2012 study observes that prior Australian research has suffered from limited datasets, resulting in mixed and weak results compared to U.S. studies."[164] Ultimately, the ERA did not adopt the Fama-French model due, in part, to concerns over the variation in factor coefficients and risk premiums.[165] If the datasets and other technical advances that are now available 1) improve upon the ability to draw valid statistical conclusions, 2) align the Australian research with the vast U.S. literature, and 3) conclude that the Fama-French model is superior to the Sharpe-Lintner CAPM for estimating the required return on equity, then this supports utilising the Fama-French model as part of the estimation process. Whether or not some of the prior Australian research might be less reliable because it is based on a less comprehensive data set is no longer a relevant issue.

290. Brailsford, Gaunt and O'Brien (2012a) further report that:

> The factors are then tested across a range of portfolios in both time series and in cross section. The results reveal that all factors are significant in both the time series and cross-sectional tests and that the premiums carry significant positive exposures.[166]

and:

> In a series of comparative tests, the three-factor model is found to be consistently superior to the CAPM, although neither model can fully explain the time-series variation in portfolio returns.[167]

291. Brailsford, Gaunt and O'Brien (2012a) conclude that:

> This evidence is important for a number of reasons. Firstly, the findings appear to settle the disputed question as to whether the value premium is indeed a positive and significant factor in the Australian market. Given the growing trend to utilize the three-factor model in asset-pricing tests and in practical strategies of portfolio formation in the funds management industry, these findings provide direction. Secondly, the evidence continues the decline of the single-factor model, which has obvious implications for future research. This future research should include the added benefits of using a multifactor model to estimate cost of capital for firms.[168]

[163] Brailsford, Gaunt and O'Brien (2012a), p. 261.
[164] ERA Rate of Return Guideline, Explanatory Statement, Appendix 8, Paragraph 73.
[165] ERA Rate of Return Guideline, Explanatory Statement, Appendix 8, Paragraph 77. The other concern raised by the ERA is the theoretical basis for the Fama-French model, which we discuss elsewhere in this report.
[166] Brailsford, Gaunt and O'Brien (2012a), p. 279.
[167] Brailsford, Gaunt and O'Brien (2012a), p. 279.
[168] Brailsford, Gaunt and O'Brien (2012a), p. 279.

292. The ATCO Gas Draft Decision rejects the findings and conclusions of the published study of Brailsford, Gaiunt and O'Brien (2012) on the basis of an analysis performed by the ERA itself. However, there are a number of problems with the ERA "study":

a) The whole point (in fact, the *only* point) of performing a cross-sectional test is to determine whether the FFM provides a superior fit to the data relative to the CAPM. However, the ERA study does not consider the CAPM at all, so it cannot answer the question of whether the FFM or CAPM provides the better fit to the data that it examines;

b) The ERA study is based on five years of data. Cross-sectional asset-pricing studies simply do not employ a single sample period of five years. This is nowhere near a long enough data period to test any asset pricing model. For example, the CAPM predicts that high-beta stocks outperform the market when the market is rising and that they underperform the market when the market is falling. Suppose the CAPM is true and that stocks perform exactly as the CAPM predicts. Also suppose that we seek to test the CAPM during a single 5-year period over which the market fell. We would conclude (on the basis of this single period) that high-beta stocks under-perform low-beta stocks. The justification for such a uniquely short data period is claimed to be that:

> As a standard Australian regulatory control period is 5 years, estimates of parameters in the calculation of a rate of return are generally conducted every 5 years. As such, daily data of stock and market returns for the 5 year period from 1 July 2009 to 31 May 2014 are adopted.[169]

This justification is clearly in error. The fact that regulatory parameters are reset every five years has nothing at all to do with the length of data that is required for a valid cross-sectional asset-pricing test. It also has nothing at all to do with the length of data that regulators themselves use to estimate WACC parameters. By way of one example, the ERA itself uses more than 50 years of historical excess returns data to estimate MRP.

c) The results of the ERA "study" are implausible, which is likely due to the fact that a single period of five years is not nearly enough data to even begin to think about conducting a cross-sectional asset pricing test. By way of one example, the market risk premium estimates[170] are almost uniformly negative. As another example, the tables to Appendix 4 highlight the relatively few cells where the Fama-French are not statistically significant. The ERA reports standard errors for these cells that are in the order of 10,000 times the corresponding terms in all other cells. It is almost certain that this is driven by a data error.

293. In our view, any one of these points alone provides a sufficient basis to conclude that the ERA "study" provides no relevant evidence. However, the ERA "study" is contaminated by *all* of them. Our conclusion is that no reasonable person could possibly give any weight to the ERA "study" over the published study of Brailsford, Gaunt and O'Brien, which concludes that:

> the three-factor model is found to be consistently superior to the CAPM,[171]

[169] ERA ATCO Gas Draft Decision, Appendix 4, Paragraph 17.
[170] The λ_β terms in Table 2 of Appendix 4 to the ATCO Gas Draft Decision.
[171] Brailsford, Gaunt and O'Brien (2012a), p. 279.

and that:

> the findings appear to settle the disputed question as to whether the value premium is indeed a positive and significant factor in the Australian market,

and makes particular reference to:

> the added benefits of using a multifactor model to estimate cost of capital for firms.[172]

294. We note that since our last submission to the ERA, we have prepared a submission to the AER (SFG 2014 FFM) that addresses a range of conceptual and empirical issues in relation to the Fama-French model. We attach that submission as an appendix to this report and we rely on the results reported in it to inform our estimate of the required return on equity for the benchmark firm.

The Black CAPM

295. In its ATCO Gas Draft Decision, the ERA noted that:

> The Authority rejected the use of the Black CAPM in the Rate of Return Guidelines, on the basis that its empirical performance was unreliable. [173]

296. We note that the Black CAPM is used extensively in US regulation cases precisely because of its superior empirical performance relative to the Sharpe-Lintner CAPM. Indeed, in US regulation cases, the Black CAPM is known as "the empirical CAPM" because it is a version of the CAPM that has more reliable empirical performance. There is also a large academic literature that attests to the superior empirical performance of the Black CAPM.[174] In our view, it would be an error to prefer the Sharpe-Lintner CAPM to the Black CAPM on general empirical performance grounds.[175]

297. Relative to the Sharpe-Lintner CAPM, the Black CAPM requires the estimation of one additional parameter – the zero-beta premium. In the Black CAPM, the zero beta premium is added to the risk-free rate in the two places where the risk-free rate appears in the CAPM equation. This has the effect of increasing the intercept and decreasing the slope in the linear CAPM equation. The result is higher estimates of the expected return for low-beta assets and symmetrically lower estimates of expected returns for low-beta assets. The ERA has expressed concerns about the ability to quantify this additional parameter:

> The Authority considers that the Black CAPM is only useful to the extent that it suggests a downward bias in the return on equity generated by the Sharp Linter CAPM for firms with an equity beta less than 1. The Authority is of the view that it is difficult to quantify the extent of any downward bias. [176]

298. At the time of our previous submission to the ERA,[177] no precise estimates were available for the zero-beta premium for the Australian market. There was, however, a study by NERA (2013) which showed that for the Australian market there was no statistically significant relationship between beta (as estimated by Australian regulators) and subsequent returns. This implies a flat CAPM line whereby all firms have the same expected return as the market regardless of their beta estimates. In

[172] Brailsford, Gaunt and O'Brien (2012a), p. 279.
[173] ERA ATCO Gas Draft Decision, pp. 159-160, Paragraph 693.
[174] See the summary in SFG (2014 Black).
[175] The Black CAPM does, however, require the estimation of one additional parameter, and we address that issue below.
[176] ERA ATCO Gas Draft Decision, p. 172, Paragraph 755.
[177] SFG (2014 ERA).

our previous submission we had some regard to this evidence, which suggests that the benchmark firm (like all other firms) would have an expected return similar to that for the broad market portfolio. This evidence is consistent with the Black CAPM framework in that it increases the intercept and flattens the slope of the standard Sharpe-Lintner CAPM.

299. In its ATCO Gas Draft Decision,[178] the ERA notes that the only evidence available for the Australian market has been the NERA (2013) study. The ERA has disregarded that evidence on the basis that it is not sufficiently reliable.

300. We note that since our last submission to the ERA, we have prepared a submission to the AER (SFG 2014 Black) that provides a reliable estimate of the zero beta premium for the Australian market, and which addresses all of the issues raised in the AER and ERA Guidelines in relation to the Black CAPM. That submission also:

    a) Sets out the theory behind the Black CAPM, which is the same as the theory behind the Sharpe-Lintner CAPM, but without the unrealistic assumption that investors can borrow and lend as much as they like at the risk-free rate;

    b) Sets out our methodology for estimating the zero-beta premium. We note that the AER has proposed a range of reasonable estimates of the zero-beta premium and our estimate is consistent with that range; and

    c) Uses the Black CAPM to derive estimates of the required return on equity for the benchmark firm.

301. We attach that submission as an appendix to this report and we rely on the results reported in it to inform our estimate of the required return on equity for the benchmark firm. That is, we now have regard to our specific estimate of the required return for the benchmark firm from the Black CAPM in preference to the broad evidence from NERA (2013) that was available at the time of our previous submission to the ERA. Specifically, the Black CAPM posits that:

$$r_e = (r_f + r_z) + \beta(r_m - r_f - r_z)$$

where r_z is the zero-beta premium. NERA (2013) concluded that there was no statistically significant difference between r_z and the market risk premium, such that:

$$\begin{aligned} r_e &= (r_f + MRP) + \beta(r_m - r_f - MRP) \\ &= (r_f + MRP) = r_m. \end{aligned}$$

302. This was the most up to date information available at the time of our previous report. In our attached report, we now present an updated estimate of the zero-beta premium of 3.34% and we adopt that value in our estimation below. That is, we use our Black CAPM estimate as one piece of relevant evidence to which we have regard to inform our estimate of the required return on equity for the benchmark firm – see Paragraphs 314, 331-332, and 348-349 below.

Conclusions in relation to the use of models other than the Sharpe-Lintner CAPM

303. Under the previous Rules, the Australian Competition Tribunal held that if a regulator or regulated business (a) was using a well-accepted financial model such as the CAPM, and (b) had a reasonable

[178] ERA ATCO Gas Draft Decision, p. 139, Paragraph 590.

basis for each of its parameter estimates, then it must automatically be the case that the resulting estimate of the required return on equity was reasonable and commensurate with the prevailing conditions in the market. That position was the primary driver for the AEMC's return on equity rule change.

304. In making fundamental changes to the Rules, the clear intention of the AEMC was to alter the regulatory practice of relying exclusively on the SL CAPM when estimating the required return on equity. In referring to the Tribunal's conclusion that the use of a well-accepted financial model effectively guaranteed that the resulting estimate of the required return on equity was reasonable and commensurate with the prevailing conditions in the market, the AEMC stated:

> The Commission considered that this conclusion presupposes the ability of a single model, by itself, to achieve all that is required by the objective. The Commission is of the view that any relevant evidence on estimation methods, including that from a range of financial models, should be considered to determine whether the overall rate of return objective is satisfied.[179]

305. The AEMC went on to state that:

> The Commission considered that no one method can be relied upon in isolation to estimate an allowed return on capital that best reflects benchmark efficient financing costs [180]

306. The AEMC explicitly linked the consideration of a range of models to the production of the best possible estimate of the efficient financing costs as required by the National Gas Objective (NGO) and Revenue and Pricing Principles (RPP):

> Achieving the NEO, the NGO, and the RPP requires the best possible estimate of the benchmark efficient financing costs. The Commission stated that this can only be achieved when the estimation process is of the highest possible quality. The draft rule determination stated that this meant that a range of estimation methods, financial models, market data and other evidence must be considered.[181]

307. That is, the AEMC's clear view is that the NGO and RPP require the regulator to produce the best possible estimate of the required return on equity,[182] which in turn requires the consideration of a range of financial models.

308. In our view, the continued exclusive reliance on the SL CAPM excludes the consideration of relevant evidence, does not produce "the best possible estimate," and does not meet the requirements of the Rules.[183]

309. Moreover, it is our view that the ERA's rejection of all models other than the Sharpe-Lintner CAPM is based on a number of errors as follows:

    a) It is an error of logic to decide that *all* industry dividend discount models are irrelevant based on the outcomes of the (very different) AER model;

[179] AEMC Final Determination, p. 48.
[180] AEMC Final Determination, p. 49.
[181] AEMC Rule Change Final Determination, p. 43.
[182] The required return on equity is a key component of the efficient financing costs.
[183] Specifically, NGR 87(5).

b) The ERA has erred in its conclusion that the SFG dividend discount model leads to an upward bias in the estimate of the required return on equity – the AER's Guideline makes it clear that the ERA has interpreted this point backwards;

c) It is an error to reject the Fama-French model on the basis of its empirical motivation. Logically, it makes no sense to maintain sole reliance on the CAPM due to the fact that alternative models were originally developed for the purpose of improving the very poor empirical performance of the CAPM;

d) No reasonable person could possibly give any weight to the ERA "study" of the Fama-French model over the published study of Brailsford, Gaunt and O'Brien, which concludes that "the three-factor model is found to be consistently superior to the CAPM"[184] in the Australian market;

e) It is an error to disregard the Black CAPM on theoretical or empirical grounds. It is based on the same theory as the Sharpe-Lintner CAPM but with less restrictive assumptions, and its performance is consistently documented as being superior to the Sharpe-Lintner CAPM – so much so that it is known as "the empirical CAPM" in US regulation cases.

310. In summary, it is our view that there is no valid reason to conclude that the industry dividend discount model, Fama-French model, and Black CAPM are irrelevant. These three models provide relevant evidence and the quality of the allowed return on equity is improved by having regard to them. As set out above, a high quality estimate of the return on equity requires evidence "from a range of financial models."[185]

311. For all of the reasons set out above, our view is that the ERA has excluded relevant financial models and that having regard to those financial models would lead to a materially preferable estimate of the allowed return on equity that is more consistent with the ARORO, NGO and RPP.

[184] Brailsford, Gaunt and O'Brien (2012a), p. 279.
[185] AEMC Final Determination, p. 48.

6. Distilling a point estimate for the required return on equity for the benchmark firm

Our previous submission to the ERA

312. In our previous submission to the ERA, we proposed to have regard to four methods to inform our estimate of the required return on equity:

    a) Sharpe-Lintner CAPM;

    b) Black CAPM (where we used the required return of the average firm, given the available evidence at the time from NERA (2013) indicated a flat empirical CAPM line whereby all firms had the same expected return regardless of their beta estimates);

    c) Fama-French model; and

    d) Dividend discount model.

313. Our previous submission recognised, at a high level, that each of these approaches have different strengths and weaknesses along different dimensions, which led us to propose a simple average of the four estimates.

A weighted-average approach

314. Since our previous submission to the ERA, we have continued to develop our estimates using each of the four approaches set out above. We have updated our parameter estimates for all models and we have developed an approach for estimating the zero-beta premium for the Black CAPM. We have also further developed our consideration of the relative strengths and weaknesses of the four approaches, as follows:

    a) The Sharpe-Lintner CAPM has the disadvantage of producing estimates of expected returns that have little or no relationship with actual returns – that is, it provides a poor fit to the observed data. However, the Sharpe-Lintner CAPM is commonly used in practice, albeit often in a modified form and we agree that systematic risk is a useful way to think about risks incorporated into market prices. Also, it has been the practice of Australian regulators to use the Sharpe-Lintner CAPM exclusively, in which case it would be appropriate to at least continue to have regard to that approach. Consequently, our view is that the Sharpe-Lintner CAPM estimate of the required return is relevant evidence and some regard should be given to it. The limitations of the Sharpe-Lintner CAPM are that it does not account for all priced risks and its parameter estimates from standard empirical analysis have limited reliability.

    b) The Black CAPM provides a better fit to the empirical data than the Sharpe-Lintner CAPM and it is commonly used in rate of return regulation cases in other jurisdictions (where it is known as the "empirical CAPM"). The Black CAPM is also more theoretically sound than the Sharpe-Lintner CAPM because it does not rely upon the assumption that investors can borrow at the risk-free rate, but rather that investors can sell short. The Black CAPM does not, however, overcome a major disadvantage of the Sharpe-Lintner CAPM, which is that there is no statistically significant relationship between beta estimates and stock returns. In our view, the fact that the Black CAPM requires the estimation of an additional parameter does not affect the fact that it provides relevant evidence and some regard should be given to it.

c) The Fama-French model has the advantage of providing an unambiguously better fit to the data than the Sharpe-Lintner CAPM. However, whereas it is commonly used as an estimate of required returns in academic studies, it is less commonly used in valuation and regulatory practice. Our view is that the Fama-French estimate of the required return is relevant evidence and some regard should be given to it.

d) The dividend discount model approach has the advantage of not requiring any assumptions about what factors drive required returns – it simply equates the present value of future dividends to the current stock price. It is also commonly used in industry and regulatory practice. Consequently, our view is that the dividend discount estimate of the required return is relevant evidence and some regard should be given to it.

315. Because all of the models have different strengths and weaknesses along different dimensions, it is impossible to identify one superior model that alone would out-perform the combined evidence of *all* of the relevant models. This is consistent with the AEMC's views that:

a) "no one method can be relied upon in isolation to estimate an allowed return on capital that best reflects benchmark efficient financing costs;"[186] and that

b) The NEO, NGO and RPP can only be achieved by obtaining "the best possible estimate of the benchmark efficient financing costs," which in turn requires the use of a range of financial models.[187]

316. Consequently, our view is that any approach that adopts a single "superior" model, and which effectively disregards other relevant models, will not provide "the best possible estimate of the benchmark efficient financing costs." That is, a piece of evidence should only be disregarded if having regard to it would detract from the quality of the final estimate. Any sub-standard estimate of financing costs will inevitably lead to investors being either under- or over-compensated – neither of which are in the long-run interests of consumers.

317. After consideration of the relative strengths and weaknesses of the four approaches, and consideration of the reliability of the most recent estimates that are available, we propose to take a weighted average of approaches, as set out in Table 12 below.

318. We note below that our final estimate is relatively insensitive to the precise weightings applied to each the four approaches relative to other reasonable weighting schemes. A materially different final estimate can only be obtained by applying disproportionate weight to one of the models and immaterial weight to the others.

319. The rationale for the proposed weights is as follows:

a) 25% weight is applied to the dividend discount model and a total of 75% weight is applied to the three asset-pricing models. Because all four models have different strengths and weaknesses as set out above, our default starting point would be to assign 25% weight to each model. We then adjust weights among the asset pricing models for the reasons set out below;

b) Of the 75% weight that is applied to asset-pricing models, we apply half to the Fama-French model and half to the CAPM. That is the question of whether the value premium is a proxy

[186] AEMC Final Determination, p. 49.
[187] AEMC Final Determination, p. 43.

for a risk factor or a statistical aberration is addressed by applying equal weight to each possibility;

c) A total of 37.5% weight is applied to the CAPM. The two forms of the CAPM differ only in terms of the intercept that is used (since the same values of beta and the required return on the market are used for both models). The Black CAPM uses an empirical estimate of the intercept – selected to provide the best possible fit to the observed data. The Sharpe-Lintner CAPM uses a theoretical lower bound for the intercept (i.e., the intercept cannot possibly be lower than the risk-free rate). Thus, we do not have two estimates to choose between – we have an empirical estimate and a theoretical lower bound. It is for this reason that we apply twice as much weight to the Black CAPM. This approach is equivalent to setting the CAPM intercept two-thirds of the way between the theoretical lower bound and the empirical estimate.

Table 12
Proposed model weightings

Method	Weighting
Sharpe-Lintner CAPM	12.5%
Black CAPM	25.0%
Fama-French model	37.5%
Dividend discount model	25.0%

320. In the remainder of this subsection, we set out our current estimates of the required return on equity for the benchmark firm using each of the four approaches that we consider to provide relevant evidence.

The Sharpe-Lintner CAPM

321. The Sharpe-Lintner CAPM requires the estimates of three parameters: the risk-free rate, the required return on the market, and equity beta. In this section, we consider the best available estimates of each of these parameters.

Risk-free rate

322. For the reasons set out above, our preferred estimate of the risk-free rate is the 20-day average (annualised) yield on 10-year government bonds. As at 9 September 2014, that estimate is 3.58%.

Required return on the market (or average firm)

323. As set out in the previous section of this report, our view is that the best available estimate of the required return on the market is currently 11.19%, incorporating the effect of imputation credits where theta is set to 0.35 and gamma is set to 0.25.

Equity beta

324. We have most recently considered equity beta in our submission to the AER, SFG (2014 Beta),[188] that is attached as an appendix to this report. In that report, we conclude that:

a) The statistical analysis of domestic comparable firms (four of which currently exist) is relevant information that should be used to inform the estimate of equity beta. However,

[188] SFG, 2014 Beta, *Equity beta*, May.

the sample size is too small to produce reliable results by itself. Indeed, there is evidence that the results produced by this small sample of firms is statistically unreliable when considered alone;

b) The statistical analysis of international comparable firms (which currently number in excess of fifty) is relevant information that should be used to inform the estimate of equity beta; and

c) The tiered approach that is proposed in the ERA's Guideline, whereby a subset of the relevant evidence is used to determine an initial range (of 0.4 to 0.7) and other relevant evidence is used only to select a point from within that range (even though it supports an estimate strictly above 0.7) should not be used. Rather, all relevant evidence should be considered together in light of the relative strengths and weaknesses of each piece of evidence.

325. SFG (2014 Beta) conclude that the best empirical estimate of equity beta, having regard to all relevant evidence and considering the relative strengths and weaknesses of each piece of evidence, is 0.82. That estimate is based on a range of regression analyses applied to domestic and international comparables, with each domestic comparable firm receiving twice as much weight as an international comparable firm. As set out above and in SFG (2014 Beta), our view is that this is an appropriate estimate of beta because it has regard to all relevant evidence and because the alternative "domestic only" estimate is unreliable.

326. Our primary reason for adopting the approach and the estimate set out in SFG (2014 Beta) is that the domestic data set is too small (currently only five firms) to produce any sort of reliable estimates. Evidence in support of the unreliability of estimates from this tiny sample is set out in SFG (2014 Beta) and includes:

a) The fact that the range of estimates is very wide such as the vast majority of estimates do not even fall within the ERA's proposed range;

b) The estimates are unstable and vary dramatically over short periods of time;

c) Movement in the estimates is inconsistent over time with estimates for some comparables materially increasing over the same period that estimates for other comparables materially decrease; and

d) The estimates vary materially depending on which day of the week is used to measure returns.

327. By contrast, the sample of 56 international comparables is much larger and not affected by small-sample issues to nearly the same degree. Moreover, the international comparables were carefully selected to ensure that they are primarily engaged in regulated distribution and transmission activities.

328. The final estimate from SFG (2014 Beta) is based on an average that includes the domestic and international comparables (to obtain a sample size that is sufficient to produce meaningful results) but with each domestic comparable receiving twice as much weight as each international comparable to reflect their greater comparability. We adopt that estimate of 0.82 in this report.

Sharpe-Lintner CAPM estimate of the required return on equity for the benchmark firm

329. Our implementation of the Sharpe-Lintner CAPM adopts the following parameter estimates:

a) We adopt a contemporaneous risk-free rate of 3.58%;

b) We adopt an estimate of the required return on the market of 11.19% for the reasons set out above; and

c) We adopt a Sharpe-Lintner CAPM beta estimate of 0.82 from SFG (2014 Beta).

330. These parameter estimates produce an estimate of the required return on equity of:

$$r_e = r_f + \beta(r_m - r_f)$$
$$= 3.58\% + 0.82(11.19\% - 3.58\%) = 9.80\%.$$

The Black CAPM

331. The Black CAPM requires estimates of the same parameters as the Sharpe-Lintner CAPM as well as an estimate of the zero-beta premium. In our view, the best available estimate of the zero-beta premium is set out in the report attached as an appendix, SFG (2014 Black).[189] That report provides an estimate of the zero-beta premium of 3.34%, which is within the reasonable range set out in the AER's Guideline materials.[190] This estimate is also consistent with the estimates that have been reported for US data – which led to the original development of the Black CAPM.[191]

332. Adding the zero-beta premium of 3.34% to the risk-free rate of 3.58% provides an estimate of the required return on a zero-beta asset of 7.46%. Consequently, the required return on equity is estimated as:

$$r_e = r_f + \beta(r_m - r_f)$$
$$= 6.92\% + 0.82(11.19\% - 6.92\%) = 10.41\%.$$

The Fama-French three-factor model

333. For the Fama French model, SFG (2014 FFM)[192] which is attached as an appendix to this report, sets out the most recently available estimates of the parameters required for the Fama-French model. Parameter estimates are supplied for a sample of nine domestic firms (five of which are currently listed) and 56 international firms. The estimates set out below apply twice as much weight to each of the nine domestic firms (based on their greater comparability) relative to the international firms. However, we show below that the final estimate of the required return on equity is not at all sensitive to this choice.[193]

334. We begin by using the Fama-French model to estimate the ex-imputation required return on equity. This requires an estimate of the ex-imputation risk premium associated with each of the three factors. SFG (2014 FFM) report ex-imputation estimates of the Fama-French SMB and HML factors. As set out above, we adopt a with-imputation market risk premium of 7.61%, which corresponds to an ex-imputation market risk premium of 6.53% using the approach of Officer (1994) as implemented by IPART (2013) and the PTRM.[194]

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189 SFG (2014 Black), Cost of equity in the Black capital asset pricing model, May.

190 AER Rate of Return Guideline, Explanatory Statement, Appendix C, p. 71.

191 See Friend and Blume (1970), Black, Jensen and Scholes (1972), and Fama and MacBeth (1973).

192 SFG (2014 FFM), Using the Fama-French model to estimate the required return on equity for the benchmark efficient entity, May.

193 This occurs because Australian-listed firms have relatively higher estimates of exposure to the HML factor than U.S.-listed firms and U.S.-listed firms have relatively higher estimates of beta. These two results are offsetting.

194 $(7.61 + 5.58)\left(\frac{1 - 0.3}{1 - 0.3(1 - 0.25)}\right) - 3.58 = 6.53.$

335. In summary, the relevant estimates are:

a) Market beta of 0.77[195] and ex-imputation market risk premium of 6.53%;[196]

b) Risk premium in relation to the size factor $(s \times SMB)$ of -0.19%;[197] and

c) Risk premium in relation to the book-to-market factor $(h \times HML)$ of 1.15%.[198]

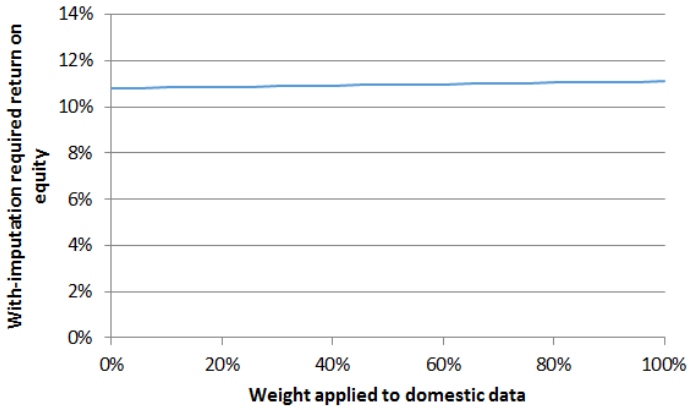
336. Using these estimates in the Fama-French model yields an estimate of the ex-imputation required return on equity of 10.11%, as set out below:

$$r_e = r_f + \beta \times MRP + s \times SMB + h \times HML$$
$$= 3.58\% + 0.77 \times 6.53\% - 0.19\% + 1.15\% = 9.61\%.$$

337. This corresponds to a with-imputation estimate of the required return on equity of 10.64%.[199]

338. The estimates set out above are based on the application of 24% weight to the domestic data and 76% weight applied to the international data. The final estimate of the required return on equity is insensitive to the choice of weights because the domestic and international data produce final estimates that are not materially different. This is illustrated in Figure 7 below.

Figure 7
Fama-French estimates of the required return on equity



Source: SFG calculations. Gamma set to 0.25.

339. In summary, we adopt a Fama-French with-imputation estimate of the required prevailing market return on equity of 10.87%. This is higher than the CAPM estimates due primarily to the book-to-market factor. The comparable firms tend to be high book-to-market firms and the Fama-French

[195] For Australian-listed firms, the beta estimate in the Fama-French model is 0.48 and for U.S.-listed firms the beta estimate in the Fama-French model is 0.87. On average across the two sets of firms, 0.48 × 0.243 + 0.87 × 0.757 = 0.77.
[196] Note that this estimate of the market beta will only be exactly equal to the Sharpe-Lintner CAPM beta estimate if the market factor is statistically orthogonal to the other two Fama-French factors, so a different estimate is not evidence of inconsistency. In any event, in this case, the estimate of 0.77 is very close to the Sharpe-Lintner CAPM estimate of 0.82.
[197] For Australian-listed firms, $s \times SMB$ = 0.03 × –0.43% = –0.01% and for U.S.-listed firms, $s \times SMB$ = –0.07 × 3.58% = –0.25%. On average across the two sets of firms, (–0.01% × 0.243) + (–0.25% × 0.757) = –0.19%.
[198] For Australian-listed firms, $h \times HML$ = 0.30 × 9.97% = 2.99% and for U.S.-listed firms, $h \times HML$ = 0.12 × 4.81% = 0.56%. On average across the two sets of firms, (2.99% × 0.243) + (0.56% × 0.757) = 1.15%.
[199] $9.61 \div \left(\frac{1-0.3}{1-0.3(1-0.25)}\right) = 10.64.$

model accommodates the fact that such firms consistently generate (require) returns that are above CAPM estimates.

Dividend discount model

340. In our view, the best available dividend discount model estimate of the required return on equity for the benchmark firm is computed in the way that we have set out in our recent submission to the AER, SFG (2014 DDM).[200] In that report, we apply the dividend discount approach to a broad market index and also to the set of comparable firms that are used to estimate equity beta for use in the CAPM. We compare the estimates of the required returns of the comparable firms with those of the broad market index. We report that the risk premium for the comparable firms (i.e., the difference between the dividend discount model estimate of the required return and the risk-free rate) averages 94% of the risk premium of the market. This implies a dividend discount model estimate of the with-imputation required return of the benchmark comparable firm of 10.76%.[201]

341. Finally, we note that the use of the dividend discount model to estimate the required return on the market portfolio and the required return on a benchmark efficient entity does not amount to double counting. The dividend discount model is simply a framework for processing relevant data into an estimate of the required return. Data for the market portfolio produces an estimate of the required return on the market, and data for the benchmark firm produces an estimate of the required return for the benchmark firm. Similarly, there is no double counting involved in using historical stock returns to estimate the required return on the market and for the benchmark firm – market data is used to estimate the market return and benchmark firm data is used to estimate the return for the benchmark firm.

Aggregation of estimates

342. Table 12 below summarises the estimates from the four approaches we consider. The weighted-average with-imputation estimate of the required return on equity for the benchmark firm is 10.51%.

Table 13
Estimates of the required return on equity for a benchmark efficient entity

Method	Required return on equity	Weighting
Sharpe-Lintner CAPM	9.80%	12.5%
Black CAPM	10.41%	25.0%
Fama-French model	10.64%	37.5%
Dividend discount model	10.76%	25.0%
Weighted average	10.51%	100%

343. We note that the final estimate of the required return on equity for a benchmark efficient entity is relatively insensitive to the choice of weights. For example, the final estimate varies by less than 25 basis points if:

a) The Sharpe-Lintner and Black CAPM are assigned equal weight and no other changes are made;

b) All four models are assigned equal weight;

[200] SFG (2014 DDM), Alternative versions of the dividend discount model and the implied cost of equity, May.
[201] $3.58 + 0.94 \times 7.61 = 10.76$.

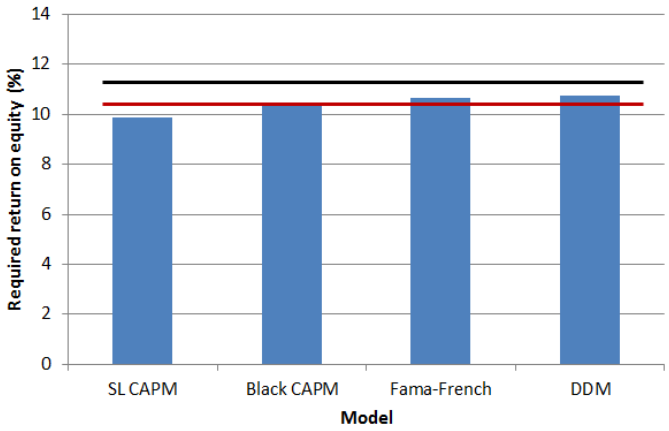
c) The dividend discount model is omitted and the other models are assigned equal weight; or

d) The Fama-French model is omitted and the other models are assigned equal weight.[202]

344. We do not recommend any of the alternative weighting schemes listed above – we simply note that the final estimate of the required return on equity is relatively insensitive to the proposed weighting scheme. In our view, the approach set out in Table 12 is the best available estimate of the required return on equity for a benchmark efficient entity and best reflects the prevailing conditions in the market for equity funds.

345. Figure 8 below shows the estimates from each of the four models together with the proposed estimate of the required return on equity for a benchmark efficient entity (red line) and the estimate of the required return on equity for the average firm (black line).

Figure 8
Summary of estimates of the required return on equity



Source: SFG calculations.

Foundation model CAPM estimates

Overview

346. In its Guideline, the AER proposes to use the Sharpe-Lintner CAPM as a "foundation model." This involves using the Sharpe-Lintner CAPM to the exclusion of all other models, but where the equity beta estimate is adjusted to help correct for the documented empirical failings of the Sharpe-Lintner model. For example, the AER proposes to have regard to the Black CAPM evidence when estimating equity beta for use in the Sharpe-Lintner CAPM. The ERA, while not referring to a "foundation model" also proposes to have regard to other models when parameterising the Sharpe-Lintner model.

347. This approach requires estimates of the three CAPM parameters. In our view, the estimates of the risk-free rate and MRP set out above apply without modification when using the CAPM as a

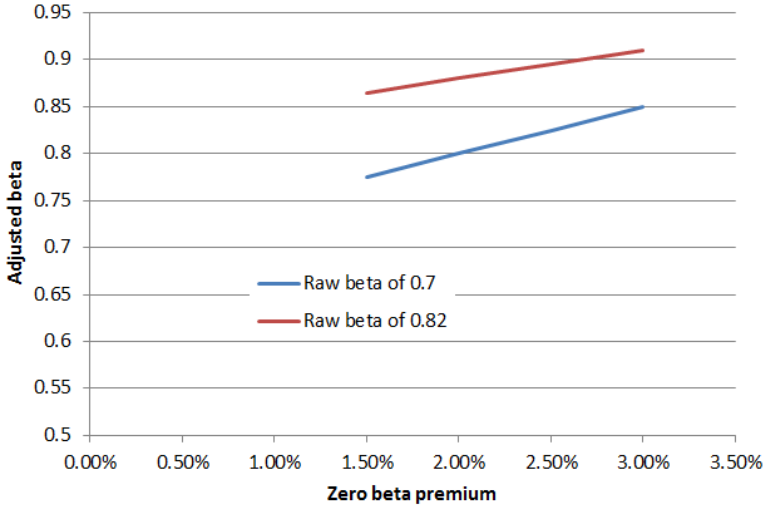
[202] Recall that under the AER's Guideline, the cost of equity will either be set to the foundation model estimate, or a different value rounded to the nearest 25 basis points. That is, 25 basis points is considered to be rounding error for the estimate of the required return on equity under the Guideline. We do not advocate rounding to the nearest 0.25% because that approach can only provide a cost of equity estimate that is further away from the estimate of the prevailing cost of funds that uses all available information. We simply note that the AER considers 0.25% to be an indication of a small margin for error. This does not mean that an estimate is better if it is adjusted to the nearest 0.25%.

foundation model. However, the estimate of equity beta must be revised to incorporate the relevant evidence from other models.

Adjustments for evidence of low beta bias: Black CAPM

348. The AER's Guideline materials Appendix C, Table C.11, p. 71 demonstrates how a raw Sharpe-Lintner CAPM beta estimate can be adjusted to reflect evidence from the Black CAPM. Figure 9 below summarises the adjustments that are required to the raw empirical beta estimates for the sample calculations that are set out in the Guideline. For example, a raw empirical beta estimate of 0.7 would need to be adjusted to 0.85 to be consistent with a zero-beta premium of 3%. Similarly, a raw empirical beta estimate of 0.82 would need to be adjusted to 0.91 to be consistent with a zero beta premium of 3%.

Figure 9. Adjustments required for Black CAPM evidence



Source: SFG calculations.

349. In our view, as set out above, when populating the Sharpe-Lintner CAPM the best parameter estimates that are currently available are a beta estimate of 0.82, an MRP estimate of 7.61 and a zero-beta premium of 3.34%. In conjunction with a risk-free rate of 3.58%, this implies that when populating the Sharpe-Lintner CAPM foundation model, 0.90 is the best estimate of beta that is reflective of the evidence in relation to the Black CAPM (i.e., the evidence that the Sharpe-Lintner CAPM systematically understates the required return on low-beta stocks).[203]

Adjustments for evidence of a value premium: Fama-French model

350. There is also evidence that the required return for high book-to-market (or "value") stocks is consistently and materially higher than the Sharpe-Lintner CAPM would suggest. Indeed the evidence for the book-to-market effect is at least as extensive and comprehensive as the evidence of the low-beta/Black CAPM effect. A summary of that evidence is set out in SFG (2014 FFM).[204]

351. Consequently, our view is that – if the foundation model approach is to be used – the beta estimate should be informed by evidence about high book-to-market stocks requiring higher returns. The Guideline already demonstrates how a raw beta estimate can be adjusted to reflect the Black CAPM

[203] Under the Black CAPM, the estimated cost of equity is 10.41%. Under the Sharpe-Lintner CAPM, to match the same cost of equity, $\beta_e = (r_e - r_f) \div (r_m - r_f) = (0.1041 - 0.0358) \div 0.0761 = 0.90$.
[204] SFG (2014 FFM), Using the Fama-French model to estimate the required return on equity for the benchmark efficient entity, May.

evidence of a low beta bias. The same approach can also be used to reflect the Fama-French evidence of a book-to-market bias (also known as the "value premium").

352. An equity beta estimate of 0.93, when inserted into the Sharpe-Lintner CAPM, produces an estimate of the required return on equity that is consistent with the Fama-French evidence of a value premium.[205] We therefore adopt 0.93 as the estimate of beta that best corrects for the empirical evidence that the required return for high book-to-market stocks is consistently and materially higher than the Sharpe-Lintner CAPM would suggest.

Adjustments for dividend discount evidence

353. The dividend discount model can be used as an alternative way of estimating the required return on equity for the benchmark firm. A detailed explanation and assessment of the dividend discount approach is set out in SFG (2014 DDM).[206] In that report, we estimate that the risk premium for the comparable firms (i.e., the difference between the dividend discount model estimate of the required return and the risk-free rate) averages 94% of the risk premium of the market. This implies that an equity beta estimate of 0.94 reflects the contemporaneous evidence in relation to the dividend discount model for use in a foundation model approach.

Conclusions and recommendations in relation to the foundation model approach

354. Table 14 below summarises the estimates of equity beta that reflect the contemporaneous evidence in relation to each of the relevant financial models – for the purposes of the foundation model approach. Applying the weights set out in Table 12[207] produces an overall foundation model equity beta estimate of 0.91.

Table 14
Estimates of equity beta to reflect evidence from relevant financial models

Model	Required return on equity	Equity beta
SL CAPM	9.80%	0.82
Black CAPM	10.41%	0.90
Fama-French	10.64%	0.93
DDM	10.76%	0.94
Weighted average		0.91

355. The composite foundation model equity beta estimate of 0.91 produces an estimate of the required return on equity of 10.51%:

$$\begin{aligned} r_e &= r_f + \beta \times MRP \\ &= 3.58\% + 0.91 \times 7.61\% = 10.51\%. \end{aligned}$$

356. We note that this foundation model estimate of the required return on equity (10.51%) is identical to the estimate that is obtained in Table 13 above. This is because both approaches combine information from the same four relevant financial models and both approaches apply the same weighting scheme. Indeed, the foundation model approach can only produce a different estimate of

[205] Under the Fama-French model, the estimated cost of equity is 10.64%. Under the Sharpe-Lintner CAPM, to match the same cost of equity, $\beta_e = (r_e - r_f) \div (r_m - r_f) = (0.1064 - 0.0358) \div 0.0761 = 0.93$.
[206] SFG (2014 DDM), Alternative versions of the dividend discount model and the implied cost of equity, May.
[207] We apply the same weights to the various models whether they are being used to compute a composite estimate of the required return on equity or a composite estimate of beta.

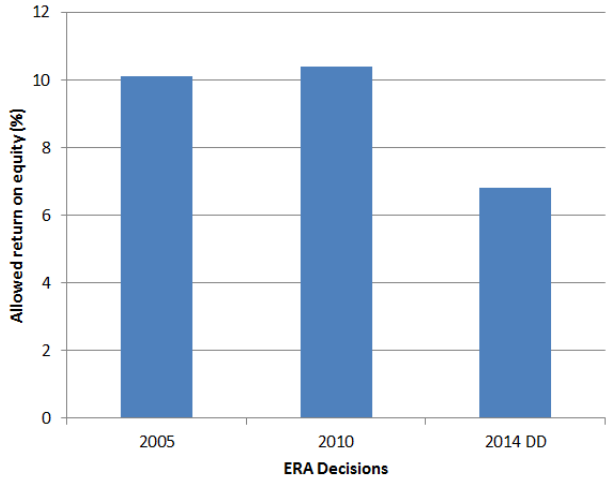
the required return on equity if it is implemented in such a way as to either (a) omit evidence that would otherwise have been considered, or (b) change the relative weights that would otherwise have been applied to some evidence.

7. Final conclusions

Practical effect of the ATCO Gas Draft Decision

357. The allowed return on equity in the ATCO Gas Draft Decision is 6.8%. Figure 10 below compares this allowed return on equity to allowances in previous ERA decisions for the same gas distribution network.

Figure 10. Allowed return on equity in recent decisions



Source: ERA Decisions

358. Figure 10 shows that the ATCO Gas Draft Decision proposes to reduce the allowed return on equity by 35%. There are two components of this reduction:

a) The risk-free rate has been reduced by 47% – from 5.61% to 2.95%; and

b) The premium for risk has been reduced by 20% – from 4.80% to 3.85%.

359. That is, the ERA has compounded the material reduction in its estimate of the risk-free rate with a material reduction in its estimate of the premium for risk.

360. As part of its work for the Rate of Return Guideline, the ERA undertook a substantial statistical analysis of the stationarity of (a) the required return on equity and (b) the market risk premium. The ERA concluded that the overall required return on equity was stationary and that the market risk premium was not. Thus, when the risk-free rate falls the MRP tends to rise, and vice versa. This results in the MRP varying in the opposite direction to the risk-free rate such that the overall required return on equity is relatively stationary. In its ATCO Gas Draft Decision, the ERA confirms that:

> consistent with the evidence, the Authority's view is that the return on equity is more stable than the MRP, over the longer term. [208]

361. However, the ATCO Gas Draft Decision proposes a dramatic change in the estimate of the required return on equity. Part of this is due to a reduction in the ERA's estimate of the risk-free rate, but that is compounded by a material decrease in the ERA's estimate of the premium for risk. Rather than the risk premium serving to offset some of the change in the risk-free rate (such that the return on equity is more stable), the ATCO Gas Draft Decision adds to the decrease in the risk-free rate by a further material decrease in the risk premium

[208] ERA ATCO Gas Draft Decision, p. 163, Paragraph 712.

Errors in the ERA's estimate of the allowed return on equity

362. In our view, a series of errors have led the ERA to its conclusion that the allowed return on equity should be decreased by 35% via compounding material reductions in its estimates of the risk-free rate and the premium for risk;

a) **Equity beta**: As set out in Section 2 of this report, our view is that the ERA has erred in its reliance on a set of domestic comparators that is too small to produce reliable results. In our view, international comparators are relevant evidence and the ERA has erred in disregarding that evidence.

b) **Market risk premium**: As set out in Section 3 of this report, our view is that the ERA has erred in its estimation of the market risk premium in the following respects:

i) The ERA has not properly analysed the evidence that it has regard to. For example, the ERA uses stale historical returns data that has not been amended for inaccuracies that have been identified in it or for the ERA's material change in its estimate of the value of imputation credits. Another example is that the ERA has incorrectly interpreted dividend discount analyses as providing a direct estimate of the MRP rather than of the required return on the market; and

ii) The ERA has disregarded relevant evidence. For example, the ERA states that it will use the Wright approach to inform its estimate of MRP, but then does not do so.

c) **Risk-free rate**: As set out in Section 4 of this report, our view is that the ERA has erred in adopting a five-year term for the risk-free rate. The five-year term is based on the ERA's "present value principle." However, the very derivation of the present value principle shows that it is only consistent with a five-year term if the end-of-period market value of the asset is known with certainty from the outset. Since it is not, a longer term should be used, consistent with the dominant commercial and regulatory practice.

d) **Consideration of other relevant models**: As set out in Section 5 of this report, our view is that the ERA has erred in disregarding all models other than the Sharpe-Lintner CAPM for the purposes of estimating the required return on equity. In our view, other models do provide relevant evidence and proper consideration of them would have illuminated the extreme outcome that the ERA has arrived at from its mechanistic implementation of a single model.

363. In our view, these errors all compound one another and all of them lead to the allowed return on equity being smaller than it would have been in the absence of those errors.

Rationale for correcting errors

364. As set out above, the AEMC has explicitly stated that achieving the National Gas Objective (NGO) and Revenue and Pricing Principles (RPP) requires the best estimate possible in the circumstances of the benchmark efficient financing costs, an important component of which is the required return on equity:

> Achieving the NEO, the NGO, and the RPP requires the best possible estimate of the benchmark efficient financing costs. The Commission stated that this can only be achieved when the estimation process is of the highest possible quality. The draft rule

> determination stated that this meant that a range of estimation methods, financial models, market data and other evidence must be considered.[209]

and that, in this regard, the AEMC has amended the Rules to require that:

> In determining the *allowed rate of return*, regard must be had to relevant estimation methods, financial models, market data and other evidence.[210]

365. For the reasons set out above, our view is that the ERA's current estimate of the allowed return on equity is not the best possible estimate. It then follows that the ERA has not produced "the best possible estimate of the benchmark efficient financing costs" as required by the AEMC above and in the Allowed Rate of Return Objective. It also follows, as set out by the AEMC above, that the ERA's allowed return will not achieve the NGO or RPP. Specifically, a key part of the NGO is to:

> promote efficient investment in…natural gas services…for the long term interests of consumers.[211]

366. An allowed return on equity that is materially below the efficient financing costs of the benchmark efficient entity will create incentives for under investment, which is not in the long-term interests of consumers.

367. Similarly, the RPP require that:

> regard should be had to the economic costs and risks of the potential for under and over investment, [212]

and that:

> a reference tariff should allow for a return commensurate with the regulatory and commercial risks involved.[213]

368. These principles cannot be complied with if the allowed return does not reflect the best estimate possible in the circumstances of the efficient financing costs of the benchmark efficient entity.

369. The RPP also require that:

> a service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs,[214]

which would seem to require that the allowed return must be at least commensurate with the efficient financing costs of the benchmark efficient entity.

370. For all of the reasons set out above, our view is that:

[209] AEMC Rule Change Final Determination, p. 43.
[210] National Gas Rules, clause 87(5).
[211] National Gas Law, s. 23.
[212] National Gas Law, s. 24(6).
[213] National Gas Law, s. 24(5).
[214] National Gas Law, s. 24(2).

a) The Draft Decision should be varied so that the Final Decision corrects each of the errors we have identified in this report; and

b) Doing so will, or will be likely to, result in a decision which is materially preferable to the Draft Decision in making a contribution to the NGO as regards the estimation and quantum of the cost of equity.

371. In forming these views we have taken into account the constituent components of the cost of equity and how they interrelate with each other, the RPPs, and the Draft Decision as a whole as it relates to the cost of equity, together with each of the other relevant considerations raised through-out this report.

8. Declaration

372. I confirm that I have made all the inquiries that I believe are desirable and appropriate and no matters of significance that I regard as relevant have, to my knowledge, been withheld from the Court.

Professor Stephen Gray

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Appendix 1: Curriculum Vitae of Professor Stephen Gray

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Academic Qualifications

1995 Ph.D. (Finance), Graduate School of Business, Stanford University.
Dissertation Title: Essays in Empirical Finance
Committee Chairman: Ken Singleton
1989 LL.B. (Hons), Bachelor of Laws with Honours, University of Queensland.
1986 B.Com. (Hons), Bachelor of Commerce with Honours, University of Queensland.

Employment History

2000-Present Professor of Finance, UQ Business School, University of Queensland.
1997-2000 Associate Professor of Finance, Department of Commerce, University of Queensland and Research Associate Professor of Finance, Fuqua School of Business, Duke University.
1994-1997 Assistant Professor of Finance, Fuqua School of Business, Duke University.
1990-1993 Research Assistant, Graduate School of Business, Stanford University.
1988-1990 Assistant Professor of Finance, Department of Commerce, University of Queensland.
1987 Specialist Tutor in Finance, Queensland University of Technology.
1986 Teaching Assistant in Finance, Department of Commerce, University of Queensland.

Academic Awards

2006 Outstanding Professor Award, Global Executive MBA, Fuqua School of Business, Duke University.
2002 Journal of Financial Economics, All-Star Paper Award, for Modeling the Conditional Distribution of Interest Rates as a Regime-Switching Process, JFE, 1996, 42, 27-62.
2002 Australian University Teaching Award – Business (a national award for all university instructors in all disciplines).
2000 University of Queensland Award for Excellence in Teaching (a University-wide award).
1999 Outstanding Professor Award, Global Executive MBA, Fuqua School of Business, Duke University.
1999 KPMG Teaching Prize, Department of Commerce, University of Queensland.
1998 Faculty Teaching Prize (Business, Economics, and Law), University of Queensland.
1991 Jaedicke Fellow in Finance, Doctoral Program, Graduate School of Business, Stanford University.
1989 Touche Ross Teaching Prize, Department of Commerce, University of Queensland.
1986 University Medal in Commerce, University of Queensland.

Large Grants (over $100, 000)

- Australian Research Council Linkage Grant, 2008—2010, Managing Asymmetry Risk ($320,000), with T. Brailsford, J.Alcock, and Tactical Global Management.
- Intelligent Grid Cluster, Distributed Energy – CSIRO Energy Transformed Flagship Collaboration Cluster Grant, 2008-2010 ($552,000)
- Australian Research Council Research Infrastructure Block Grant, 2007—2008, Australian Financial Information Database ($279,754).
- Australian Research Council Discovery Grant, 2006—2008, Capital Management in a Stochastic Earnings Environment ($270,000).
- Australian Research Council Discovery Grant, 2005—2007, Australian Cost of Equity.
- Australian Research Council Discovery Grant, 2002—2004, Quantification Issues in Corporate Valuation, the Cost of Capital, and Optimal Capital Structure.

- Australian Research Council Strategic Partnership Grant, 1997—2000, Electricity Contracts and Securities in a Deregulated Market: Valuation and Risk Management for Market Participants.

Current Research Interests

Benchmark returns and the cost of capital. Corporate Finance. Capital structure. Real and strategic options and corporate valuation. Financial and credit risk management. Empirical finance and asset pricing.

Publications

Gray, S., I. Harymawan and J. Nowland, (2014), "Political and government connections on corporate boards in Australia: Good for business?" *Australian Journal of Management,* forthcoming.

Brailsford, T., S. Gray and S. Treepongkaruna, (2013), "Explaining the bid-ask spread in the foreign exchange market: A test of alternate models," *Australian Journal of Management,* forthcoming.

Faff, R., S. Gray and M. Poulsen, (2013), "Financial inflexibility and the value premium," *International Review of Finance,* forthcoming.

T. Fitzgerald, S. Gray, J. Hall and R. Jeyaraj, (2013), "Unconstrained estimates of the equity risk premium" *Review of Accounting Studies,* 18, 560-639.

Gray, S. and J. Nowland, (2013), "Is prior director experience valuable?" *Accounting and Finance,* 53, 643-666.

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Chan, K-F., R. Brooks, S. Treepongkaruna and S. Gray, (2011), "Asset market linkages: Evidence from financial, commodity and real estate assets," *Journal of Banking and Finance*, 35, 6, 1415-1426.

Parmenter, B, A. Breckenridge, and S. Gray, (2010), 'Economic Analysis of the Government's Recent Mining Tax Proposals', *Economic Papers*: *A Journal of Economics and Policy*, 29(3), September, 279-91.

Gray, S., C. Gaunt and Y. Wu, (2010), "A comparison of alternative bankruptcy prediction models," *Journal of Contemporary Accounting and Economics*, 6, 1, 34-45.

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Gray, S. and J. Hall, (2008), "The Relationship Between Franking Credits and the Market Risk Premium: A Reply," *Accounting and Finance*, 48, 1, 133-142.

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Choy, E., S. Gray and V. Ragunathan, (2006), "The Effect of Credit Rating Changes on Australian Stock Returns," *Accounting and Finance*, 46(5), 755-769.

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Gray, S. and S. Treepongkaruna, (2006), "Are there non-linearities in short-term interest rates?" *Accounting and Finance*, 46(1), 149-167.

Gray, P., S. Gray and T. Roche, (2005), "A Note on the Efficiency in Football Betting Markets: The Economic Significance of Trading Strategies," *Accounting and Finance*, 45(2) 269-281.

Duffie, D., S. Gray and P. Hoang, (2004), "Volatility in Energy Prices. In V. Kaminski," (Ed.), *Managing Energy Price Risk: The New Challenges and Solutions* (3rd ed.). London: Risk Books.

Cannavan, D., F. Finn and S. Gray, (2004), "The Value of Dividend Imputation Tax Credits in Australia," *Journal of Financial Economics*, 73, 167-197.

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Gray, S. and S. Treepongkaruna, (2003), "On the Robustness of Short-term Interest Rate Models," *Accounting and Finance*, 43(1), 87-121.

Gray, S. and S. Treepongkaruna, (2002), "How to Value Interest Rate Derivatives in a No-Arbitrage Setting," *Accounting Research Journal* (15), 1.

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Gray, P. and S. Gray, (2001), "Option Pricing: A Synthesis of Alternate Approaches," *Accounting Research Journal*, 14(1), 75-83.

Dahlquist, M. and S. Gray, (2000), "Regime-Switching and Interest Rates in the European Monetary System," *Journal of International Economics*, 50(2), 399-419.

Bollen, N., S. Gray and R. Whaley, (2000), "Regime-Switching in Foreign Exchange Rates: Evidence from Currency Options," *Journal of Econometrics*, 94, 239-276.

Duffie, D., S. Gray and P. Hoang, (1999), "Volatility in Energy Prices. In R. Jameson," (Ed.), *Managing Energy Price Risk* (2nd ed.). London: Risk Publications.

Gray, S. and R. Whaley, (1999), "Reset Put Options: Valuation, Risk Characteristics, and an Example," *Australian Journal of Management*, 24(1), 1-21.

Bekaert, G. and S. Gray, (1998), "Target Zones and Exchange Rates: An Empirical Investigation," *Journal of International Economics*, 45(1), 1-35.

Gray, S. and R. Whaley, (1997), "Valuing S&P 500 Bear Market Warrants with a Periodic Reset," *Journal of Derivatives*, 5(1), 99-106.

Gray, S. and P. Gray, (1997), "Testing Market Efficiency: Evidence from the NFL Sports Betting Market," *The Journal of Finance*, 52(4), 1725-1737.

Gray, S. (1996), "Modeling the Conditional Distribution of Interest Rates as a Regime- Switching Process," *Journal of Financial Economics*, 42, 27-62.

Gray, S. (1996), "Regime-Switching in Australian Interest Rates," *Accounting and Finance*, 36(1), 65-88.

Brailsford, T., S. Easton, P.Gray and S. Gray, (1995), "The Efficiency of Australian Football Betting Markets," *Australian Journal of Management*, 20(2), 167-196.

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Gray, S. and A. Lynch, (1990), "An Alternative Explanation of the January Anomaly," *Accounting Research Journal*, 3(1), 19-27.

Gray, S. (1989), "Put Call Parity: An Extension of Boundary Conditions," *Australian Journal of Management*, 14(2), 151-170.

Gray, S. (1988), "The Straddle and the Efficiency of the Australian Exchange Traded Options Market," *Accounting Research Journal*, 1(2), 15-27.

Teaching

Fuqua School of Business, Duke University, Student Evaluations (0-7 scale):

- Financial Management (MBA Core): Average 6.5 over 7 years.
- Advanced Derivatives: Average 6.6 over 4 years.
- Empirical Issues in Asset Pricing: Ph.D. Class

1999, 2006 Outstanding Professor Award, Global Executive MBA, Fuqua School of Business, Duke University.

UQ Business School, University of Queensland, Student Evaluations (0-7 scale):

- Finance (MBA Core): Average 6.6 over 10 years.
- Corporate Finance Honours: Average 6.9 over 10 years.

2002 Australian University Teaching Award – Business (a national award for all university instructors in all disciplines).
2000 University of Queensland Award for Excellence in Teaching.
1999 Department of Commerce KPMG Teaching Prize, University of Queensland.
1998 Faculty Teaching Prize, Faculty of Business Economics and Law, University of Queensland.
1998 Commendation for Excellence in Teaching, University-wide Teaching Awards, University of Queensland.
1989 Touche Ross Teaching Prize, Department of Commerce, University of Queensland.

Board Positions

2002 - Present: Director, Financial Management Association of Australia Ltd.
2003 - Present: Director, Moreton Bay Boys College Ltd. (Chairman since 2007).
2002 - 2007: External Risk Advisor to Board of Enertrade (Queensland Power Trading Corporation Ltd.)

Consulting

Managing Director, Strategic Finance Group: www.sfgconsulting.com.au.

Consulting interests and specialties, with recent examples, include:

- **Corporate finance**
  - ⇒ **Listed multi-business corporation:** Detailed financial modeling of each business unit, analysis of corporate strategy, estimation of effects of alternate strategies, development of capital allocation framework.

- **Capital management and optimal capital structure**
  - ⇒ **State-owned electricity generator:** Built detailed financial model to analyze effects of increased leverage on cost of capital, entity value, credit rating, and stability of dividends. Debt of $500 million issued.

- **Cost of capital**
  - ⇒ **Cost of Capital in the Public Sector:** Provided advice to a government enterprise on how to estimate an appropriate cost of capital and benchmark return for Government-owned enterprises. Appearance as **expert witness** in legal proceedings that followed a regulatory determination.
  - ⇒ **Expert Witness:** Produced a written report and provided court testimony on issues relating to the cost of capital of a cable TV business.
  - ⇒ **Regulatory Cost of Capital:** Extensive work for regulators and regulated entities on all matters relating to estimation of weighted-average cost of capital.

- **Valuation**

⇒ **Expert Witness:** Produced a written report and provided court testimony. The issue was whether, during a takeover offer, the shares of the bidding firm were affected by a liquidity premium due to its incorporation in the major stock market index.

⇒ **Expert Witness:** Produced a written report and provided court testimony in relation to valuation issues involving an integrated mine and refinery.

- **Capital Raising**
  - ⇒ Produced comprehensive valuation models in the context of capital raisings for a range of businesses in a range of industries including manufacturing, film production, and biotechnology.

- **Asset pricing and empirical finance**
  - ⇒ **Expert Witness:** Produced a written report on whether the client's arbitrage-driven trading strategy caused undue movements in the prices of certain shares.

- **Application of econometric techniques to applied problems in finance**
  - ⇒ **Debt Structure Review:** Provided advice to a large City Council on restructuring their debt portfolio. The issues involved optimisation of a range of performance measures for each business unit in the Council while simultaneously minimizing the volatility of the Council's equity in each business unit.
  - ⇒ **Superannuation Fund Performance Benchmarking:** Conducted an analysis of the techniques used by a large superannuation fund to benchmark its performance against competing funds.

- **Valuation of derivative securities**
  - ⇒ **Stochastic Volatility Models in Interest Rate Futures Markets:** Estimated and implemented a number of models designed to predict volatility in interest rate futures markets.

- **Application of option-pricing techniques to real project evaluation**
  - ⇒ **Real Option Valuation:** Developed a framework for valuing an option on a large office building. Acted as arbitrator between the various parties involved and reached a consensus valuation.
  - ⇒ **Real Option Valuation:** Used real options framework in the valuation of a bio-tech company in the context of an M&A transaction.

Appendix 2: Instructions

Partner: Roxanne Smith +61 8239 7108
Email: roxanne.smith@jws.com.au
Our Ref: B1299
Your Ref:
Doc ID: 66276535.1

24 November 2014

Professor Stephen Gray
SFG Consulting
PO Box 29
SOUTH BANK QLD 4101

Dear Sir

ATCO Gas Australia Pty Ltd – ERA Price Determination

We act for ATCO Gas Australia Pty Ltd (**ATCO Gas**) in relation to the Economic Regulation Authority's (**ERA**) review of the Gas Access Arrangement for ATCO Gas under the National Gas Law and Rules for the period July 2014 to December 2019. As you are aware, ATCO Gas submitted to the ERA with its Access Arrangement Proposal a report from SFG entitled "*Estimating the required return on equity*" dated 13 March 2014.

On 14 October 2014, the ERA published its Draft Decision in relation to ATCO Gas' Access Arrangement Proposal.

ATCO Gas wishes to engage you to prepare an expert report in connection with the ERA's Draft Decision.

This letter sets out the matters which ATCO Gas wishes you to address in your report and the requirements with which the report must comply.

Terms of Reference

Legal Framework

The terms and conditions upon which ATCO Gas provides access to its gas network are subject to five yearly reviews by the ERA. The ERA undertakes that review by considering the terms and conditions proposed against criteria set out in the National Gas Law and National Gas Rules.

Rule 76 of the National Gas Rules provides that the total revenue for each regulatory year is determined using a building block approach, which building blocks include a return on the projected capital base (Rule 76(a)) and depreciation on the projected capital base (Rule 76(b)).

Rule 87 provides for the determination of a rate of return on the projected capital base. The amended Rule 87 now in force requires a rate of return to be determined on a *nominal* vanilla basis. Rule 87 requires that the allowed rate of return be determined such that it achieves the allowed rate of return objective, being:

> "*…that the 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 reference services.*"

Rule 87(5) requires that in determining the allowed rate of return, regard must be had to, *inter alia, relevant estimation methods, financial models, market data and other evidence.*

The return on equity is to be estimated such that it contributes to the achievement of the allowed rate of return objective. Regard must also be had to the prevailing conditions in the market for equity funds (Rule 87(6) and (7)).

Rule 74(2) requires a forecast or estimate to be arrived at on a reasonable basis and must represent the best forecast or estimate possible in the circumstances.

As you are aware, Rule 87(13) also provides for the making of rate of return guidelines. The ERA published its Final Rate of Return Guidelines on 16 December 2013.

Also relevant is the overarching requirement that the ERA must, in performing or exercising its economic regulatory function or power perform or exercise that function or power in a manner that will or is likely to contribute to the achievement of the national gas objective (**NGO**).

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

You should also have regard to the Revenue and Pricing Principles (**RPP**) in section 24 of the National Gas Law.

In preparing your report you should consider the relevant sections of the National Gas Rules and Law and the ERA's Rate of Return Guidelines and Explanatory Statement.

Return on Equity

In respect of the return on equity, the ERA continues to hold the view expressed in its Final Rate of Return Guidelines that, for the purposes of Rule 87(5), only the Sharpe Lintner CAPM model is relevant for informing the ERA's estimation of the prevailing return on equity for the regulated firm, at the current time.

In the Draft Decision the ERA applies the approach in the Guidelines to a large extent, but departs from the Guidelines in respect of some parameters in the application of the Sharpe Lintner CAPM.

Opinion

In this context ATCO Gas wishes to engage you to prepare an expert report which:

1 Responds to the ERA's Draft Decision finding that only the Sharpe Lintner CAPM is relevant and its rejection of the multi-model approach set out in your report of March 2014.

2 Critiques the ERA's revised approach to the estimate of the market risk premium and whether it provides the best estimate of that parameter.

3 Considers the ERA's estimate of equity beta and its reasons for rejecting the approach set out in your March report.

4 Responds to the ERA's reasons for continuing to use a 5 year term for the risk free rate.

5 Provides your opinion on whether the ERA's approach in the Draft Decision to the cost of equity results in the best estimate that contributes to the achievement of the allowed rate of return objective.

6 Provides your opinion on whether the ERA's approach in the Draft Decision to the cost of equity results in a cost of equity consistent with prevailing conditions in the market for equity funds.

7 Provides your opinion on whether the ERA's approach in the Draft Decision to the cost of equity is consistent with the achievement of the NGO and the RPP.

8 If in your opinion the ERA's approach does not meet the requirements of the Rules identified above, has your opinion in your March report in relation to the method for estimating the cost of equity (having regard to "*relevant estimation methods, financial models, market data and other evidence*") in order to produce the best estimate that complies with the Rules 87(5), (6) and (7) and the achievement of the NGO and RPP, changed?

Contribution to the achievement of the NGO

One of the issues for the ERA is whether, where there are two or more overall decisions that could be made as to approval of ATCO Gas Australia Pty Ltd's (**ATCO Gas**) proposed revised access arrangement, to make the one that the regulator is satisfied will or is likely to contribute to the achievement of the national gas objective[1] to the greatest degree.

On any merits review of the Final Decision before the Australian Competition Tribunal, one of the issues for the Tribunal would be whether a fresh decision correcting errors that might have been made by the ERA would be materially preferable to the ERA's decision in making a contribution to the achievement of the NGO.[2]

In the light of the above, in addition to the topics you have been asked to deal with above please include in your Report the following matters:

1 On the assumption that the errors (if any) in the Draft Decision which you identify in your Report are repeated in the Final Decision, would you please in your Report make an assessment of whether, either separately or collectively,[3] those errors if corrected would, or would be likely to, result in a materially preferable designated NGO decision as regards the relevant topic.

[1] As set out in s 23 of the National Gas Law.
[2] As that term is defined in s 259(4a)(c) of the National Gas Law.
[3] See s 246(1a) of the National Gas Law.

2 In doing this work, and if you make an affirmative assessment, please provide the basis upon which you make the assessment that the result will, or will likely, be materially preferable.

3 In doing so, in particular would you please include in your Report the following:[4]

(a) a consideration of how the constituent components of those parts of the decision which you have been asked to consider interrelate with each other and with the matters you have raised as errors (and which may therefore be grounds for review);

(b) how you have taken account of the revenue and pricing principles;[5] and

(c) in assessing the extent of the contribution of the correction(s) you identify in your Report to the achievement of the national gas objective, your consideration of the decision as a whole in respect of the topics you have reviewed. We note that section 23 of the National Gas Law provides:

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

In relation to question 3 above, we stress that this is not an exhaustive list and that any other matter that may be relevant under the Law should be taken into account (the opening words of s 259(4b) make this clear). If you are in doubt about whether a matter may or may not be relevant in this regard, please include your consideration of it in your Reports. In particular, you should take into account any other matter you reasonably consider material and relevant and should indicate the relevant matter or matters which informs your opinions on the "materially preferable" issue.

Further, in relation to questions 1-3 above, please note that[6] the following matters do not, in themselves, determine the question about whether a materially preferable decision exists, namely:

1 the establishment of a ground for review under section 246(1), that is, whether there is error or are errors;

2 consequences for, or impacts on, the average annual regulated revenue of a covered pipeline service provider; or

3 that the amount that is specified in or derived from the decision exceeds the threshold amount required for the granting of leave (under section 249(2)).

Use of Report

It is intended that your report will be submitted by ATCO Gas to the ERA with its response to the Draft Decision. The report may be provided by the ERA to its own advisers. The report must be expressed so that it may be relied upon both by ATCO Gas and by the ERA.

[4] Which the Tribunal itself is required under s 259(4b) of the National Gas Law to have regard to when assessing whether a result will be, or will be likely to be, materially preferable.
[5] As set out in s 24 of the National Gas Law.
[6] Under s 259(4b) of the National Gas Law.

The ERA may ask queries in respect of the report and you will be required to assist in answering these queries. The ERA may choose to interview you and if so, you will be required to participate in any such interviews.

The report will be reviewed by ATCO Gas' legal advisers and will be used by them to provide legal advice as to its respective rights and obligations under the *National Gas Law* and *National Gas Rules*.

If ATCO Gas was to challenge any decision ultimately made by the ERA, that appeal will be made to the Australian Competition Tribunal and your report will be considered by the Tribunal. ATCO Gas may also seek review by a court and the report would be subject to consideration by such court. You should therefore be conscious that the report may be used in the resolution of a dispute between the ERA and ATCO Gas Due to this, the report will need to comply with the Federal Court requirements for expert reports, which are outlined below.

Timeframe

ATCO Gas' response to the Draft Decision must be submitted by **25 November 2014**. Your report will need to be finalised by **24 November 2014**.

Compliance with the Code of Conduct for Expert Witnesses

Attached is a copy of the Federal Court's Practice Note CM 7, entitled "*Expert Witnesses in Proceedings in the Federal Court of Australia*", which comprises the guidelines for expert witnesses in the Federal Court of Australia (**Expert Witness Guidelines**).

Please read and familiarise yourself with the Expert Witness Guidelines and comply with them at all times in the course of your engagement by ATCO Gas.

In particular, your report should contain a statement at the beginning of the report to the effect that the author of the report has read, understood and complied with the Expert Witness Guidelines.

Your report must also:

1 contain particulars of the training, study or experience by which the expert has acquired specialised knowledge;

2 identify the questions that the expert has been asked to address;

3 set out separately each of the factual findings or assumptions on which the expert's opinion is based;

4 set out each of the expert's opinions separately from the factual findings or assumptions;

5 set out the reasons for each of the expert's opinions; and

6 otherwise comply with the Expert Witness Guidelines.

The expert is also required to state that each of the expert's opinions is wholly or substantially based on the expert's specialised knowledge.

It is also a requirement that the report be signed by the expert and include a declaration 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 report".

Please also attach a copy of these terms of reference to the report.

Terms of Engagement

Your contract for the provision of the report will be directly with ATCO Gas. You should forward ATCO Gas any terms you propose govern that contract as well as your fee proposal.

Please sign a counterpart of this letter and return it to us to confirm your acceptance of the engagement.

Yours faithfully

Johnson Winter & Slattery

Enc: Federal Court of Australia Practice Note CM 7, "Expert Witnesses in Proceedings in the Federal Court of Australia"

……
Signed and acknowledged by Professor Stephen Gray

Date ……..