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8 October 2021

Economic Regulation Authority
Level 4, Albert Facey House
469-489 Wellington Street
Perth Western Australia 6000

Dear Sir/Madam

Submission on rate of return for covered Pilbara networks

With the commencement of coverage of the Pilbara networks from 1 July 2021, Horizon Power and Alinta will be subject to the Pilbara Networks Access Code 2021 (PNAC).

A building block approach, as set out in section 47 of the PNAC, will be used to determine the target revenue for the Pilbara networks of Horizon Power and Alinta. One of the key building blocks is the return on capital which is calculated by applying a rate of return to the capital base. During the first pricing period, the rate of return to be applied will be as determined by the Economic Regulation Authority (ERA). Under section 57(1) of the PNAC, the ERA must make this determination by 1 January 2022.

Section 57(2) of the PNAC states that the rate of return determined by the ERA must:

> *(a) be commensurate with the regulatory and commercial risks involved in providing covered services; and*
> *(b) have regard to regulatory precedent on rates of return in the electricity and other industries, but—*
> *i. undertake a specific assessment for the particular light regulation network based on its unique characteristics and any matters prescribed under regulation 4 of the regulations; and*
> *ii. not assume that the circumstances of each light regulation network are the same; and*
> *(c) use a pre-tax version of the cost of capital; and*
> *(d) be undertaken in accordance with the standard consultation process.*

On 2 September 2021, the ERA released an issues paper on the determination of the rate of return for the Pilbara networks. The issues paper:

> *… sets out a simple application of the ERA's standard energy network approach to determining the rate of return. This rate of return approach follows the ERA's regulatory precedent that is applied to Western Australia's covered electricity networks and gas pipelines.*[1]

[1] Economic Regulation Authority, Determination of Pilbara networks rate of return, Issues paper, 2 September 2021, para 35

The issues paper asks nine questions on specific WACC parameters to seek views on the appropriate approach for those parameters for the Pilbara Network. Our responses to those questions are provided as Appendix A.

Horizon Power has significant concerns on the approach proposed by the ERA to determining the rate of return for Horizon Power's Pilbara networks for the first pricing period. Horizon Power is of the view that the rate of return determined by applying the proposed approach is not consistent with section 57(2) of the PNAC – it is not commensurate with the regulatory and commercial risks involved in providing covered services.

In particular, Horizon Power is concerned that the ERA has used an "on the day" approach to determine a rate of return that is to apply over the first pricing period. The rate of return is being determined when government bond yields have fallen to historically low levels, exacerbated by a decision made by the Reserve Bank of Australia (RBA) on 3 November 2020 to embark on a market intervention to reduce government bond yields below the level that would otherwise have been set in the market.[2]

This constituent decision as well as others that have been proposed by the ERA, each have an adverse impact on the rate of return from Horizon Power's perspective. In aggregate, ERA's illustrative rate of return is very low, and is not commensurate with the regulatory and commercial risks involved in providing covered services, particularly for a relatively small network such as Horizon Power's Pilbara network that is highly exposed to the volatile economic fortunes of the iron ore sector.

Our key issues with the ERA's proposed approach are detailed in the attached report provided as Appendix B. In summary:

1. **Risk-free rate**: The ERA is now the only Australian regulator to use a 5-year risk free rate rather than a 10-year risk free rate. There is strong evidence that the standard regulatory and commercial practice is to use a 10-year rate, and very good reasons why that is the case, as discussed in chapter 2 of the attached report.

2. **Return on debt:** The ERA is now the only Australian regulator to use an "on the day" approach rather than the standard 10-year trailing average approach applied to estimate the total return on debt, as discussed further in chapter 3 of the attached report. The weight of regulatory precedent is to use a 10-year trailing average which smooths the volatility in the return on debt over time and reflects the commercial realities that prudent service providers hold a portfolio of debt instruments that mature progressively over time.

3. **Market risk premium (MRP):** The ERA has used a geometric means to estimate the MRP, which lowers the ERA's estimate of the MRP allowance. There is strong evidence that geometric means should not be used – including very clear statements in leading finance textbooks, as discussed in chapter 4 of the attached report.

4. **Relationship between the risk-free rate and MRP**: The ERA has paired a prevailing risk-free rate (which is at historical lows) with a long-term average MRP (which, by definition, reflects average market conditions over the historical period). This is inconsistent. As there is a negative relationship between the risk-free rate and MRP, an historically low risk-free rate should

[2] Available at https://www.rba.gov.au/media-releases/2020/mr-20-28.html

be paired with an MRP that is above its historical average, as discussed further in chapter 4 of the attached report.

5. **Equity beta**: The ERA has reduced the equity beta from 0.7 (as used in its most recent determinations) to 0.6. There is no good basis for adopting an equity beta as low as 0.6 for a generic electricity network business. Such a low beta, particularly for a network business with Horizon Power's risk profile, can only be obtained by disregarding large sections of the relevant evidence, as discussed in chapter 5 of the attached report.

In making its draft determination on the rate of return for Horizon Power's Pilbara network, the ERA must use an approach that estimates a rate of return that is consistent with section 57(2) of the PNAC – it must be commensurate with the regulatory and commercial risks involved in providing covered services and have regard to the unique characteristics of Horizon Power, in particular its small size and reliance on iron ore mining.

Given the significance of Horizon Power's concerns, Horizon Power is of the view that the ERA must determine, under section A1.7(b) of the PNAC, that a draft decision on the rate of return is warranted prior to making its final decision.

Yours sincerely

[redacted]

Sandy Morgan

Manager Network Regulation & Open Access

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APPENDIX A

Response to issues raised in the ERA's issues paper

1. *Do you support the use of a five-year term for the WACC for the Pilbara networks? If not, please explain why and provide details of your alternative approach.*

   Horizon Power does not support the use of a five-year term for the WACC for the Pilbara networks. As discussed in chapter 2 of the attached report, a 10-year term should be adopted for the risk-free rate:

   (a) The use of a 10-year rate reflects the standard practice adopted by market investors, valuation professionals and academic and practitioner textbooks.

   (b) The NPV=0 principle requires that the regulatory allowance is set to match the return that investors require – which is based on a 10-year risk-free rate.

   (c) Every Australian regulator apart from the ERA now uses a 10-year risk-free rate, matching the regulatory approach with the approach adopted by market investors—because all other regulators have recognised the economic rationale for adopting a 10-year term for the risk-free rate. It is now the case that:

      i no other Australian regulator adopts a 5-year risk-free rate

      ii no other Australian regulator considers that the NPV=0 principle prevents it from adopting a 10-year risk-free rate, consistent with market practice.

   (d) The set of algebraic derivations produced in Lally (2004) and subsequent submissions from Dr Lally have been widely rejected because:

      i Those derivations rely on the assumption that, with certainty, the market value of the regulated assets will equal the RAB at the end of the regulatory period. Since that assumption does not hold in practice, the algebraic derivations that are based on it are not relevant to the regulatory task.

      ii In any event, the term of the risk-free rate should be set according to the return that investors do require (which is very clearly based on a 10-year risk-free rate), not according to the return that Dr Lally's theoretical framework suggests they should require, on the basis of his assumptions and derivations.

2. *Do you support the use of an energy network benchmark efficient entity for both Pilbara networks? If not, please explain why and provide your proposed alternative approach. If not, are there risks not adequately captured and how might they be quantified?*

   Horizon Power supports, in principle, the use of an energy network benchmark efficient entity. However, the risk profile of the benchmark sample identified by the ERA is not comparable with the risk profile of the Pilbara networks as discussed further in section 5.7 of the attached report and in our response to question 9.

As recognised by the ERA:

- *The energy network sample includes a large proportion of assets regulated under a heavy-handed regulatory framework which determines regulatory revenues.*
- *The Pilbara networks are small in comparison to the energy network sample.*
- *The Pilbara networks service the resource industry, particularly the iron ore industry, while other Australian energy networks service a more diverse customer base*.[3]

The ERA has identified that the material risk differences between the Pilbara networks and the energy network benchmark sample could be recognised through:

- *Adjusting the energy network benchmark sample.*
- *Using the ERA's discretion when determining point estimates from a range for WACC parameters.*[4]

However, the ERA has not proposed any such adjustments in the issues paper to recognise the material differences in risk. As discussed in the responses to questions 6 (equity beta) and 8 (credit rating), Horizon Power is strongly of the view that adjustments should be made, consistent with the ERA's approach to regulating the rate of return for railways in Western Australia.

Furthermore, the decisions that the ERA has made by applying this approach has resulted in a rate of return that is inadequate to finance Horizon Power's operations. Should the concerns that have been raised in this submission not be addressed by the ERA in making its draft decision on the rate of return, then the ERA must include financeability analysis as an input to its draft decision.

3. *Do you agree that the energy networks benchmark entities are suitable for the Pilbara networks? If not, please explain why. Are there other entities that could be included in the benchmark sample?*

   Horizon Power does not agree that the energy networks benchmark entities are suitable for the Pilbara networks. As discussed further in section 5.7 of the attached report and in our response to question 8, they are not comparable in terms of size and diversity.

   Section 57(2) of the PNAC specifically provides for other industries to be considered. Horizon Power is of the view that the types of firms that are considered in determining the rate of return for the Pilbara railways should also be considered in determining the rate of return for the Pilbara networks.

   Overseas benchmark entities should be considered in addition to local benchmark entities to increase the size and comparability of the sample.

4. *Do you agree that the two Pilbara networks' risk profiles are not significantly different? If not, explain why and how differences from the benchmark sample could be quantified.*

   Horizon Power agrees that the risk profiles of the two Pilbara networks are not significantly different.

   The ERA has noted that the risk profile of Horizon Power's Pilbara network may be different to Alinta's as it also includes distribution infrastructure and supports

[3] Economic Regulation Authority, *Determination of Pilbara networks rate of return, Issues paper*, 2 September 2021, para 91
[4] Ibid, para 92

a more diverse customer base, which includes small and medium customers in the region.[5] However, it also notes that the risk profiles of transmission and distribution networks are not significantly different and that both first and second order demand is driven by the resources industries in the region.[6]

The ERA notes that both Pilbara networks exist as part of integrated businesses. While this may be the case, Alinta Energy's integrated business is significantly larger and more diversified than Horizon Power's.

We note that the ERA makes a reference to a "large customer base" in para 95 which we assume is a typographical error. If the reference is to large customers, then it should be noted that the demand by all customers in the Pilbara, not just large customers, is driven by the resources industries in the region, either directly or indirectly. If the reference is to a large number of customers, that is incorrect – the total number of customers in the Pilbara is small relative to all energy network providers in Australia.

5. *Do you support the use of a gearing level of 55 per cent for the Pilbara networks? If not, explain why and your alternative approach.*

   Horizon Power supports the use of a gearing level of 55 per cent for the Pilbara networks.

6. *Do you support the use of a 0.6 equity beta for the Pilbara networks? If not, please explain why and your alternative approach to calculating the equity beta?*

   Horizon Power does not support the use of a 0.6 equity beta for the Pilbara networks. As discussed in chapter 5 of the attached report, a 10-year term should be adopted for the risk-free rate for the following reasons:

   (a) The ERA should be very cautious about concluding, based on recent changes in empirical beta estimates for a very small sample of domestic comparators, that the equity beta allowance should be adjusted down from 0.7 to 0.6. The primary reasons for this are that:

      i There is a sharp distinction between true systematic risk (which is unobservable) and empirical estimates of beta that can be highly volatile over the short-term due to random statistical noise, rather than true changes in systematic risk.

      ii There is very compelling evidence that the recent reduction in beta estimates was driven by a sharp drop in the ASX in February and March of 2020, due to the onset of COVID-19. This fall in the ASX was quickly reversed, but the effect of that temporary shock will continue to affect the ERA's beta estimates until early 2025, since the ERA uses a 5-year historical returns window to estimate betas. In our view, it is implausible that the true systematic risk of regulated energy networks in Australia fell in response to a global pandemic that had only a temporary effect on the Australian stock market.

      iii The very small number of domestic comparators that the ERA relies on means that the ERA's beta estimates are particularly prone to statistical noise and estimation error.

[5] Ibid, para 93
[6] Ibid, para 95

iv The AER has recently presented evidence that the beta allowances set by overseas regulators that are comparable to the ERA are materially higher than the equity beta of 0.6 proposed by the ERA.

(b) The ERA should now give material weight to beta estimates of overseas comparators, rather than continue to place exclusive reliance on domestic energy comparators.

The primary reason for this is that the dwindling number of domestic comparators relied on by the ERA to estimate betas makes it increasingly untenable for the ERA to continue to rely exclusively on domestic energy comparators. The existing sample of three comparators is, in our view, insufficient to produce reliable beta estimates. That number could conceivably fall to just one firm if the proposed takeovers of AusNet Services and Spark Infrastructure proceed. When faced with similar circumstances, when estimating the betas of regulated rail networks in Western Australia, the ERA has elected to give material weight to the estimates of overseas comparator firms. The ERA should now adopt a similar approach when determining the beta allowance of regulated energy networks.

(c) The ERA should consider whether Horizon Power's coastal network should receive a higher beta allowance than other regulated energy networks.

The primary reason for this is because the ERA itself has acknowledged that Horizon Power's coastal network has a highly concentrated customer base of large customers exposed to significant commodity market risk. For similar reasons, the ERA has previously determined that it is appropriate to determine a higher equity beta for the Pilbara railways than other (more diversified) freight rail networks in Western Australia.

7. *Do you support the use of a 10-year term of debt for the Pilbara networks? If not, please explain why and your alternative approach?*

While Horizon Power supports in principle the use of a 10-year term of debt for the Pilbara networks, Horizon Power does not support the approach adopted by the ERA. Horizon Power is of the view that the allowed return on debt should be set using the standard 10-year trailing average approach adopted by all other Australian regulators, as discussed in chapter 3 of the attached report. The primary reasons for this conclusion are:

(a) The ERA's current approach to the allowed return on debt reflects a financing strategy that no business would ever consider adopting, other than to replicate the allowance provided to it by the ERA. Consequently, it is difficult to support the notion that such a strategy is prudent and efficient.

(b) The ERA's reasoning that the current approach "best approximates the NPV=0 principle" is incorrect for the reasons identified above in relation to term issues. In particular, the NPV=0 principle requires that the regulatory allowance is set equal to the efficient cost – no more and no less. If it is prudent and efficient to issue 10-year fixed-rate debt on a staggered maturity basis, the regulatory allowance should reflect the cost of that strategy.

(c) Every other Australian regulator now uses the standard 10-year trailing average approach applied to the entire return on debt, matching the regulatory approach with the approach generally observed in the market. It is now the case that:

i no other Australian regulator adopts the ERA's hybrid approach

ii no other Australian regulator considers that the NPV=0 principle prevents it from adopting the standard 10-year trailing average approach.

8. *Do you support the use of a benchmark credit rating of BBB+ for the Pilbara networks? If not, please explain why and your alternative approach?*

   Horizon Power does not support the use of a benchmark credit rating of BBB+ for the Pilbara networks.

   The ERA has determined the credit rating for the Pilbara networks based on a sample of companies. The companies that have been chosen for the sample are larger and more diversified than Horizon Power. Accordingly,iit is not appropriate to conclude that Horizon Power's credit rating should be the same as for these firms. The ERA should identify comparable firms to Horizon Power, as it does when determining the rate of return for the regulated railways.

   The ERA has previously determined that the dedicated iron-ore railways in the Pilbara are different from the general freight networks. It found that there would be some increased risk for stand-alone ore-carrying railways given their reliance on a single industry with a particular exposure to economic fluctuations.[7] This is discussed further in section 5.7 of the attached report in relation to the equity beta.

   The ERA applied separate credit ratings for each of the rail entities to reflect the different operational and risk profiles of the individual rail business.[8] The ERA determined that the appropriate credit rating for the Pilbara railways is BBB- while the credit rating for Arc Infrastructure is BBB+.[9]

   As the operational and risk profile of the Pilbara networks is different to Western Power, Horizon Power expects that the credit rating for the Pilbara networks should not be the same as for Western Power. As the credit rating for Western Power is BBB+, Horizon Power expects the credit rating for the Pilbara networks to be the same or similar to that for the Pilbara railways (BBB- or BBB).

9. *Do you support the use of a trailing average debt risk premium of 1.987 per cent for the Pilbara networks? If not, please explain why and your alternative approach?*

   While Horizon Power supports the use of a trailing average approach to determining the debt risk premium, it does not support a value of 1.987 per cent for the Pilbara networks as this is based on Western Power's BBB+ credit rating. Horizon Power expects that the application of a trailing average approach to a more appropriate credit rating for Horizon Power's Pilbara networks would result in a higher debt risk premium.

For example, in the ERA's 2021 rate of return determination for the regulated railways, the debt risk premium is 1.616 per cent for Arc Infrastructure and 2.190 per cent for the Pilbara railways.[10]

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[7] Economic Regulation Authority, *Final Determination, 2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks, and the Pilbara Railways*, 22 August 2019, para 39
[8] Ibid, para 104
[9] Ibid, para 132
[10] Economic Regulation Authority, *Determination on the 2021 weighted average cost of capital for the freight and urban railway networks, and for Pilbara railways*, 21 July 2021, para 9

APPENDIX B

Frontier Economics report, Issues in the regulatory rate of return allowance, October 2021

frontier economics

Issues in the regulatory rate of return allowance

Report for Horizon Power | 6 October 2021

Disclaimer

Contents

1 Overview

1. Frontier Economics has been retained by Horizon Power to provide an expert opinion on five issues relating to the allowed rate of return set by the Economic Regulation Authority of Western Australia (ERA). We have been asked to consider:

    a The term of the risk-free rate used in the Capital Asset Pricing Model (CAPM) to estimate the allowed return on equity;

    b The approach to setting the allowed return on debt – particularly the approach adopted when computing trailing averages;

    c The approach to setting the allowed market risk premium (MRP) – particularly:

        i Whether there is evidence of a negative relationship between the risk-free rate and the MRP, and if so, the relevance of that relationship to the approach that should be taken when estimating the MRP;

        ii Whether there is a role for the geometric mean of historical excess returns when estimating the forward-looking expected MRP, for the purposes of setting a regulated rate of return; and

        iii The relevance, if any, of the intervention in government bond markets that is currently being pursued by the Reserve Bank of Australia (RBA);

    d The appropriate equity beta for a generic Australian energy network business; and

    e Whether the specific characteristics of Horizon Power have any implications for the equity beta and credit rating parameters, relative to the average Australian energy network business.

2. Our first recommendation is that a 10-year term should be adopted for the risk-free rate. The primary reasons for that conclusion are:

    a The use of a 10-year rate reflects the standard practice adopted by market investors, valuation professionals, and academic and practitioner textbooks;

    b The NPV=0 principle requires that the regulatory allowance is set to match the return that investors require – which is based on a 10-year risk-free rate;

    c Every Australian regulator apart from the ERA now uses a 10-year risk-free rate, matching the regulatory approach with the approach adopted by market investors—because all other regulators have recognised the economic rationale for adopting a 10-year term for the risk-free rate. It is now the case that:

        i No other Australian regulator adopts a 5-year risk-free rate; and

        ii No other Australian regulator considers that the NPV=0 principle prevents it from adopting a 10-year risk-free rate, consistent with market practice;

    d The set of algebraic derivations produced in Lally (2004) and subsequent submissions from Dr Lally have been widely rejected because:

i Those derivations rely on the assumption that, with certainty, the market value of the regulated asset will equal the RAB at the end of the regulatory period. Since that assumption does not hold in practice, the algebraic derivations that are based on it are not relevant to the regulatory task; and

ii In any event, the term of the risk-free rate should be set according to the return that investors do require (which is very clearly based on a 10-year risk-free rate), not according to the return that Dr Lally's theoretical framework suggests they should require, on the basis of his assumptions and derivations.

3. Our second recommendation is that the allowed return on debt should be set using the standard 10-year trailing average approach adopted by all other Australian regulators. The primary reasons for that conclusion are:

   a The ERA's current approach to the allowed return on debt reflects a financing strategy that no business would ever consider adopting, other than to replicate the allowance provided to it by the ERA. Consequently, it is difficult to support the notion that such a strategy is prudent and efficient;

   b The ERA's reasoning that the current approach "best approximates the NPV=0 principle" is incorrect for the reasons identified above in relation to term issues. In particular, the NPV=0 principle requires that the regulatory allowance is set equal to the efficient cost – no more and no less. If it is prudent and efficient to issue 10-year fixed-rate debt on a staggered maturity basis, the regulatory allowance should reflect the cost of that strategy.

   c Every other Australian regulator now uses the standard 10-year trailing average approach applied to the entire return on debt, matching the regulatory approach with the approach generally observed in the market. It is now the case that:

      i No other Australian regulator adopts the ERA's hybrid approach; and

      ii No other Australian regulator considers that the NPV=0 principle prevents it from adopting the standard 10-year trailing average approach.

4. We make two recommendations in relation to the MRP:

   a No weight should be applied to the geometric mean of historical excess returns.

   The primary reason for this recommendation is the substantial body of evidence that concludes that it is inappropriate to place any reliance on the geometric mean of historical excess returns. Leading textbooks and case studies prepared by Professors at Harvard, Stanford, MIT, Wharton and London Business School not only report that they recommend the use of arithmetic means, but explain why it is wrong to use a geometric mean for the purpose of estimating forward-looking expected returns.

   b Real weight should be applied to the DGM estimate and the total market return approaches that allow for a negative relationship between the risk-free rate and the MRP.

   The primary reason for this recommendation is the substantial body of evidence that supports the existence of a negative relationship between the risk-free rate and the MRP. Our view is that the required return on equity has not fallen one-for-one with the decline in government bond yields that has occurred since 2018. Rather, our view is that the evidence indicates that the MRP has increased to at least partially offset the decline in government bond yields.

A key component of this body of evidence is the recent expert reports commissioned by the AER. Those reports advise that there is "no good evidence" to support the historical excess returns approach (which is the key driver of the ERA's allowance) and that such an approach is "not as effective as the approaches of other regulators." The AER's consultants have advised that consideration should be given to applying more weight to forward-looking dividend growth model (DGM) estimates and the total market return approach.

Furthermore, the impact of recent RBA interventions has pushed Australian government bond yields to record lows. In these circumstances, continuing with the assumption that the MRP is invariant to changes in the risk-free rate may result in the allowed return on equity being set below the return actually required by equity investors. Hence, it is imperative now that the ERA recognises the likelihood of an inverse relationship between the risk-free rate and the MRP.

5. We make three key recommendations in relation to the equity beta:

   a The ERA should be very cautious about concluding, based on recent changes in empirical beta estimates for a very small sample of domestic comparators, that the equity beta allowance should be adjusted down from 0.7 to 0.6.

      The primary reasons for this are that:

      i There is a sharp distinction between true systematic risk (which is unobservable) and empirical estimates of beta that can be highly volatile over the short-term due to random statistical noise, rather than true changes in systematic risk;

      ii There is very compelling evidence that the recent reduction in beta estimates was driven by a sharp drop in the ASX in February and March of 2020, due to the onset of Covid-19. This fall in the ASX was quickly reversed, but the effect of that temporary shock will continue to affect the ERA's beta estimates until early 2025, since the ERA uses a 5-year historical returns window to estimate betas. In our view, it is implausible that the true systematic risk of regulated energy networks in Australia fell in response to a global pandemic that had only a temporary effect on the Australian stock market;

      iii The very small number of domestic comparators that the ERA relies on means that the ERA's beta estimates are particularly prone to statistical noise and estimation error; and

      iv The AER has recently presented evidence that the beta allowances set by comparable regulators to the ERA overseas are materially higher than the equity beta of 0.6 proposed by the ERA.

   b The ERA should now give material weight to beta estimates of overseas comparators, rather than continue to place exclusive reliance on domestic energy comparators.

      The primary reason for this is that the dwindling number of domestic comparators relied on by the ERA to estimate betas makes it increasingly untenable for the ERA to continue to rely exclusively on domestic energy comparators. The existing sample of three comparators is, in our view, insufficient to produce reliable beta estimates. That number could conceivably fall to just one firm if the proposed takeovers of AusNet Services and Spark Infrastructure proceed. When faced with similar circumstances, when estimating the betas of regulated rail networks in Western Australia, the ERA has

elected to give material weight to the estimates of overseas comparator firms. The ERA should now adopt a similar approach when determining the beta allowance of regulated energy networks.

c The ERA should consider whether Horizon Power's coastal network should receive a higher beta allowance than other regulated energy networks.

The primary reason for this is because the ERA itself has acknowledged that Horizon Power's coastal network has a highly concentrated customer base of large customers exposed to significant commodity market risk. For similar reasons, the ERA has previously determined that it is appropriate to determine a higher equity beta for the Pilbara railways than other freight (more diversified) freight rail networks in Western Australia.

2 The term of the risk-free rate

2.1 Overview and conclusions

6. This section of the report considers the term of the risk-free rate. The key points are as follows:

   a The ERA's current approach is to use a 5-year term (in line with the length of the regulatory period) for the CAPM risk-free rate. The ERA proposes that this approach is required to comply with the NPV=0 principle – to ensure that investors in regulated firms are not over- or under-compensated.

   b Every other Australian regulator now uses a 10-year risk-free rate. It is now the case that:

      i No other Australian regulator adopts a 5-year risk-free rate; and

      ii No other Australian regulator considers that the NPV=0 principle prevents it from adopting a 10-year risk-free rate, consistent with market practice;

   c A useful consideration of this issue appears in the AER's 2018 Rate of Return Instrument, in which the AER explained in detail why it considered that a 10-year risk-free rate is consistent with the NPV=0 principle and best promotes the National Electricity Objective (NEO) and National Gas Objective (NGO). We consider that rationale to be correct and that it remains relevant today;

   d A key element of the rationale set out by the AER is that a 10-year term is consistent with the observed market and commercial practice. Indeed, there is very strong evidence that a 10-year term is used in standard academic and practitioner textbooks, by expert valuation professionals, and by market investors;

   e Australian and international regulators have explained why they have adopted a 10-year term (or even longer) to be consistent with the observed market practice. If the goal is to match the regulatory allowance to the market cost of capital (i.e., the return that investors require), the term should be set to match the practice of investors;

   f The link between the term of the risk-free rate and the NPV=0 principle (the 'term-matching' approach) was first proposed by Lally (2004).[1] Our views are that:

      i The term-matching approach relies on the assumption that the market value of the regulated asset is known with certainty at the beginning of the regulatory period. Since that assumption does not hold in practice, the algebraic derivations that are based on it are not relevant to the regulatory task. This problem with the Lally derivations has been identified by the AER and other regulators; and

      ii In any event, the term of the risk-free rate should be set according to the return that investors do require (which is very clearly based on a 10-year risk-free rate), not according to the return that Dr Lally's theoretical framework suggests they should require, on the basis of his assumptions and derivations.

[1] Lally, M., 2004, 'Regulation and the Choice of the Risk Free Rate', *Accounting Research Journal*, vol. 17 (1), pp. 18-23.

g In its current 2022 Rate of Return Instrument review process, the AER has published a working paper on the term of the risk-free rate. As well as setting out the rationale for the AER's adoption of a 10-year term, that working paper also identifies the various reasons that have been proposed to support the use of a 5-year term. We respond to those reasons, explaining why none has any real merit.

7. For the reasons set out above, our recommendation is that a 10-year term should be adopted for the risk-free rate.

2.2 The ERA's current approach

8. In its 2018 Rate of Return Guideline, the ERA adopted a 5-year term for the CAPM risk-free rate.

9. The ERA's primary rationale for setting the term of the risk-free rate equal to the length of the regulatory period was consistency with the NPV=0 principle. That principle requires that the allowed cash flows should have an expected present value equal to the regulated asset base (RAB). This is achieved by setting the allowed return on capital to be just equal to the return that investors require. If investors receive no more or less than their required return, they will (by definition) value the allowed cash flows equal to the RAB.

10. In this regard, the ERA stated that:

> *An important regulatory principle is the present value condition (NPV=0), which helps ensure that investors are compensated at a level to encourage efficient investment. This condition means that the present value of the future stream of expected cash flows of a firm is equal to the regulatory asset base. That is, the regulatory asset base maintains its value and the regulated businesses are not over or under compensated.*
>
> *In order to ensure that NPV=0, the ERA believes that the appropriate term for the risk free rate in the current regulatory setting is five years. The rate of return is reset every five years, consistent with the term of the access arrangement.* [2]

11. The link between the term of the risk-free rate and the length of the regulatory period, within the context of the NPV=0 principle, was first developed by Lally (2004).[3] That link, and Australian regulatory practice in relation to it, is addressed in detail throughout this section of the report.

12. In adopting a 5-year term, the ERA also had regard to Australian regulatory practice, noting that:

> *Some Australian regulators use Commonwealth Government Securities with a 10-year term to maturity whereas others use Commonwealth Government Securities with a five-year term to maturity or less.* [4]

13. That is, the rationale for the ERA's adoption of a 5-year risk-free rate was that:

a A 5-year term is consistent with the NPV=0 principle; and

b A 5-year term has some regulatory support.

[2] ERA, December 2018, *Rate of return guideline: Explanatory statement*, p. 97.

[3] Lally, M., 2004, 'Regulation and the Choice of the Risk Free Rate', *Accounting Research Journal*, vol. 17 (1), pp. 18-23.

[4] ERA, December 2018, *Rate of return guideline: Explanatory statement,* p. 96.

14. We show throughout this section of the report that neither of those rationales remains valid today.

2.3 Developments since 2018

15. A number of developments in relation to the term of the risk-free rate have occurred since the ERA's 2018 Rate of Return Guideline. For example, the ERA is now the only Australian regulator to adopt a 5-year risk-free rate. Every other economic regulator in Australia now adopts a 10-year risk-free rate, and a number have switched from using a 5-year term to a 10-year term.

16. The most recent survey of Australian regulatory practice was performed by the QCA as part of its current WACC review. The QCA has summarised the approaches of Australian regulators in **Figure 1** below.

Figure 1: Australian regulatory approaches to the term of the risk-free rate

Regulator	*Benchmark term to maturity (years)*	*Source*
AER	10	*Rate of return instrument, explanatory statement*, December 2018, p. 126.
ACCC	10	*Australian Rail Track Corporation's 2018 Interstate Access Undertaking*, draft decision, December 2018, pp. 126–27.
IPART	10	*Review of our WACC method*, final report, February 2018, pp. 24–25.
ESCOSA	10	*SA Water Regulatory Determination, final determination: statement of reasons*, June 2020, p. 218.
ERA (energy)	5	*Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, Appendix 5: Return on Regulated Capital Base, September 2018, p. 13.
ERA (rail)	10	*2018 and 2019 Weighted Average Cost of Capital For the Freight and Urban Networks, and the Pilbara Railways*, final determination, August 2019, p. 22.
OTTER	10	*2018 Water and Sewerage Price Determination Investigation, final report*, May 2018, p. 164.
ICRC	10	*Review of Methodologies for the Weighted Average Cost of Capital, draft report*, February 2021, p. 25.

Source: QCA, June 2021, Rate of return review, Table 13, pp. 73-74.

17. The QCA has noted that the reason why Australian regulators tend to use a 10-year term is to proxy for the long life of infrastructure investments:

> *We consider it is reasonable to use long-term Australian Government bonds based on a 10-year term to maturity.* ***We consider this approach reflects the requirements of investors*** *and lenders who, in relation to long-lived infrastructure assets, will deploy equity over the entire life of the asset, rather than over any given regulatory period. While we prefer a long-term bond based on the life of the assets, 10 years is the longest-term bond available that is sufficiently liquid. This approach is widely applied by Australian regulators.* ***Regulators have generally***

> ***accepted the argument that the term of the bond should be a proxy for the life of the regulated asset.*** [5]

18. The QCA goes on to note that a 10-year term best reflects investor expectations. That is, investors tend to determine the required return on equity using a base of the 10-year risk-free rate:

> *Given the long-term nature of infrastructure asset investment,* ***we consider that a longer-term bond may better reflect the expectations of investors*** *than a shorter-term bond.* [6]

19. The QCA concludes that the NPV=0 principle simply requires that allowed revenues should be set to reflect the efficient cost. Thus, if investors tend to use a 10-year risk-free rate when determining the required return on equity, that same approach should also be used when setting the allowed return:

> *We do not consider that the NPV=0 principle is determinative of allowable revenues…Moreover, if it is relevant at all, its only utility is to determine whether revenues recover efficient costs.* [7]

20. Thus, there have been a number of developments in this area since the ERA considered the term of the risk-free rate in its 2018 Rate of Return Guideline. It is now the case that:

    a No other Australian regulator adopts a 5-year risk-free rate; and

    b No other Australian regulator considers that the NPV=0 principle prevents it from adopting a 10-year risk-free rate, consistent with the observed market practice.

2.4 The AER's analysis of the term of the risk-free rate and the NPV=0 principle

21. A detailed analysis of the term of the risk-free rate and its relationship to the NPV=0 principle was undertaken by the AER as part of its 2018 Rate of Return Instrument (RoRI) process. The AER concluded that a 10-year risk-free rate is consistent with the NPV=0 principle and the National Electricity Objective (NEO) and National Gas Objective (NGO). In particular, the 2018 RoRI confirmed that the AER's approach is to set the allowed return on capital in a way that is consistent with the NPV=0 principle:

> *As the regulatory regime is ex-ante, we consider a rate of return that meets the objectives must provide ex-ante compensation for efficient financing costs. This is a zero net present value (NPV) investment condition, which is described as follows:*
>
> *The zero NPV investment criterion has two important properties. First, a zero NPV investment means that the ex-ante expectation is that over the life of the investment the expected cash flow from the investment meets all the operating expenditure and corporate taxes, repays the capital invested and there is just enough cash flow left over to cover investors' required return on the capital invested. Second, by definition a zero NPV investment is expected to generate no economic rents. Thus, ex-ante no economic rents are expected to be extracted as a consequence of market power. The incentive for investment is just right, encouraging neither too much investment, nor too little.*

[5] QCA, June 2021, *Rate of return review*, p. 73, emphasis added.

[6] QCA, June 2021, *Rate of return review*, p. 73, emphasis added.

[7] QCA, June 2021, *Rate of return review*, p. 34.

> *During the first concurrent evidence session, the experts agreed that setting an allowed return to achieve a zero NPV outcome achieves efficient investment incentives, and is in the long term interest of consumers.* [8]

22. That is, in the 2018 RoRI, the AER viewed its compliance with the NEO and NGO through the lens of the NPV=0 principle and set the allowed return on equity in a way that it considered to be consistent with the NPV=0 principle.

23. Within that context, the AER concluded that a 10-year risk-free rate should be adopted:

> *Our final decision is to maintain use of a 10 year term for the risk free rate. We consider the use of a 10 year term will lead to an overall rate of return that will better contribute to the achievement of the NEO and NGO. We consider a 10 year term is consistent with the theory of the Sharpe-Lintner CAPM which is a single period equilibrium model, estimating the returns an investor requires over a long-term investment horizon. The 10-year term also reflects the actual investor valuation practices and academic works.*[9]

24. That is, the reasons for the AER's adoption of a 10-year term in 2018 included the following considerations:

    a Viewed through the lens of the NPV=0 principle, a 10-year term best contributes to the achievement of the NEO and NGO;

    b A 10-year term is more consistent with the theory of the SL CAPM;

    c A 10-year term reflects the actual practices of investors; and

    d A 10-year term best reflects well-accepted academic literature.

25. In relation to consistency with the theory of the SL CAPM, the AER explained that the standard approach is to adopt a term that reflects the life of the assets:

> *We use the CAPM to estimate how an investor will value the potential returns from an investment in an infrastructure business with long-lived underlying assets. Equity investors seek out efficient returns for their diversified investment portfolio over long-term investment horizons. Although reinvestments may be [made] more frequently, they are still being made with reference to a long-term equilibrium rate of return. This will reflect the excess return required for bearing the systematic risk of the investment over the return on a long-term riskless asset.*[10]

26. The AER then noted that the standard approach adopted by market practitioners, and advocated in the academic literature, is a 10-year term:

> *We find support for using a 10 year term in actual investor valuation practices, and academic works. The 2013 and 2017 KPMG market practitioner surveys indicate around 85 per cent of practitioners use 10 year CGSs as a proxy for the risk free rate. Academic works by Pratt & Grabowksi (2010), and Damodoran (2008) also argued that 10 year CGS yields were appropriate proxies for the risk free rate, as they reflect the long-term nature of the underlying assets.*[11]

27. For example, the leading textbook by Berk and DeMarzo (2020) indicates that:

[8] AER, December 2018, Rate of Return Instrument Explanatory Statement, p. 35, emphasis added.

[9] AER, December 2018, Rate of Return Instrument Explanatory Statement, p. 126, emphasis added.

[10] AER, December 2018, Rate of Return Instrument Explanatory Statement, p. 127.

[11] AER, December 2018, Rate of Return Instrument Explanatory Statement, p. 127.

> *When discounting risk-free cash flows we **match the maturity of the interest rate to that of the cash flows**. It is common to do the same when applying the CAPM…For example, where valuing a long-term investment with an indefinite horizon, such as a stock, most financial analysts report using the yields of **long-term (10-30 year) bonds** to determine the risk-free interest rate.*[12]

28. In addition, the well-known McKinsey corporate valuation manual also recommends the use of long-term bonds:

> *Use longer-term bonds; they will be better in line with the time horizon of corporate cash flows.*[13]

29. The AER also concluded that a 10-year term would produce a valuation that is consistent with investor market valuations of similar stocks:

> *We consider that setting a rate of return using a 10 year term will provide for allowed returns on an investment in a regulated business that are comparable with the investor valuations of other stocks within the market with a similar degree of systematic risk.* [14]

30. It is important to observe that the AER defines NPV=0 in the sense that:

> *there is just enough cash flow left over to cover **investors' required return** on the capital invested* [15]

and that the AER has observed that:

> *We find support for using a 10 year term in **actual investor valuation practices***[16]

and that:

> *setting a rate of return using a 10 year term will provide for allowed returns on an investment in a regulated business that are comparable with the **investor valuations** of other stocks within the market with a similar degree of systematic risk.* [17]

31. That this, the adoption of a 10-year risk-free rate, reflecting the approach that investors take when determining their required return on long-lived investments, is consistent with the AER's definition of the NPV=0 principle and (viewed through the NPV=0 lens) the AER has concluded that this contributes to achieving the NEO and NGO.

32. In summary, the QCA and AER have both considered the NPV=0 principle and concluded that a 10-year term is consistent with it – because that is the term that is used in commercial market practice.

[12] Berk, J. and P. DeMarzo, 2020, Corporate Finance: Global 5th edition, pp. 447-448, emphasis added.

[13] Koller, T., M. Goedhart and D. Wessels, 2015, Valuation: 6th University Edition, Wiley, p. 290.

[14] AER, December 2018, Rate of Return Instrument Explanatory Statement, p. 127.

[15] AER, December 2018, Rate of Return Instrument Explanatory Statement, p. 35, emphasis added.

[16] AER, December 2018, Rate of Return Instrument Explanatory Statement, p. 127, emphasis added.

[17] AER, December 2018, Rate of Return Instrument Explanatory Statement, p. 127, emphasis added.

2.5 A 10-year risk-free rate is standard market practice – including for regulated assets

33. 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 easily observable term for Australian government bonds.

34. This practice is consistent with the view that infrastructure investments, including those subject to regulation, are long-lived investments with a long period over which cash flows are uncertain. It is also consistent with the view that regulated infrastructure investments must compete for equity capital with similar unregulated investments, for which the required return is typically based on a 10-year risk-free rate.

35. For example, the standard approach used in independent expert valuation reports is to set the risk-free rate equal to the yield on 10-year government bonds. These reports usually contain a statement to the effect that the use of a 10-year term assumption is standard practice among valuation professionals in Australia.

36. Importantly, independent valuation experts uniformly adopt a ten-year term when determining the risk-free rate for infrastructure assets, including regulated infrastructure assets across a range of different industries.

37. For example, in its 2014 report for Envestra Ltd, a firm that owns and operates regulated gas distribution networks, 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.*[18]

38. In its 2010 report for Prime Infrastructure, a business that included the DBCT coal terminal regulated by the QCA and WestNet rail regulated by the ERA, Grant Samuel included the passage above and also noted that:

> *Ten-year bonds are the accepted market benchmarks globally and are typically used as a proxy for the long-term risk-free rate where the forecast period exceeds ten years and there is no liquid market for longer term bonds.*[19]

39. In its 2017 report for DUET Ltd, a business that owns and operates gas and electricity distribution networks, including a mix of regulated and unregulated assets, KPMG stated that:

[18] Grant Samuel Independent Expert Report for Envestra Ltd, March 2014, Appendix 3, p. 4.

[19] Grant Samuel Independent Expert Report for Prime Infrastructure Ltd, October 2010, Appendix 1, p. 7.

> *...the risk-free rate is calculated with reference to Australian government securities with a ten-year term to maturity.*[20]

40. Similarly, in its 2015 report for Energy Developments Ltd, a business that owns and operates a number of unregulated electricity generation assets, Deloitte used the yield on 10-year government bonds on the basis that:

> *The frequently adopted proxy for the risk-free rate is the long-term Government bond rate.*[21]

41. Incenta (2013) also concludes 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 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.*[22]

42. The KPMG 2017 Valuation Practice Report[23] sets out the results of a survey of corporations, valuation practitioners, fund managers, private equity and infrastructure investors, and investment bankers. The survey indicates that 85% of respondents adopt a risk-free rate based on the yield on 10-year government bonds. No respondents adopt a risk-free rate based on a shorter-term government bond. The remaining respondents adopt a "house view"[24] that is otherwise unexplained. In addition, more than 80% of respondents agreed that "the risk-free rate should be adjusted to a duration that matches the life of the asset."[25]

43. In summary, even if the appropriate benchmark is a regulated asset and the appropriate allowed return is one that reflects any effects of regulation itself, the evidence above suggests that investors use a 10-year risk-free rate when determining the required return on *regulated* assets.

2.6 A 10-year risk-free rate (or longer) is standard regulatory practice

44. The general regulatory approach seeks to match the regulatory allowance to the benchmark efficient cost. Since investors determine their required return using a 10-year risk-free rate, the regulatory allowance should be set in the same way. That approach ensures that investors are (just) appropriately compensated and is therefore consistent with the NPV=0 principle.

A 10-year risk-free rate is standard Australian regulatory practice

45. Some Australian regulators previously adopted a 5-year risk-free rate, but have since determined that a 10-year rate would be more consistent with their regulatory task because it better reflects the long-lived nature of the assets and the standard commercial practice. For example, IPART

[20] KPMG Independent Expert Report for DUET Ltd, March 2017, p. 174.

[21] Deloitte Independent Expert Report for Energy Developments Ltd, September 2015, p. 57.

[22] Incenta, 2013, Term of the risk-free rate for the cost of equity, June, p. 13.

[23] Available at: https://assets.kpmg/content/dam/kpmg/au/pdf/2017/valuation-practices-survey-2017.pdf.

[24] KPMG 2017 Valuation Practices Survey, p. 10.

[25] KPMG 2017 Valuation Practices Survey, p. 11.

changed to a 10-year risk-free rate in its 2013 WACC Methodology Review and has adopted a 10-year rate in all subsequent decisions. In that decision, IPART noted that:

> *We agree with stakeholder views that increasing the TTM 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.*
>
> *Evidence indicates that asset-intensive firms with long-lived assets operating in a competitive market seek to raise debt with a maturity of 10 years or longer. A recent survey by Brotherson et al (2013) on firms' practice in estimating the cost of capital shows that firms and financial advisors unanimously responded that they use bond maturities of 10 years or longer.9 Further, investors seeking to invest in utilities, whether regulated or unregulated, have investment and financing horizons longer than 10 years.*[26]

46. Similarly, in its assessment of Queensland Rail's 2020 draft access undertaking, the QCA moved from applying a 5-year term to maturity for estimating the risk-free rate (which it has adopted in previous regulatory decisions) to applying a 10-year term.[27] In making this change, the QCA noted that other regulators have generally accepted the argument that the term of the bond should be a proxy for the life of the regulated asset. It considered that a longer-term bond may also better reflect the expectations of investors, given the long-term nature of infrastructure asset investment:

> *We acknowledge that we have undertaken extensive analysis on term-matching. However, we are no longer convinced that term-matching provides for an overall return on investment that is commensurate with the commercial and regulatory risks involved for regulated entities. As such, we have decided to adopt a 10-year bond term to estimate the risk-free rate, as part of our bottom-up WACC assessment.*[28]

47. Other Australian regulators adopt similar reasoning for their use of a 10-year risk-free rate. For example, in its 2020 determination for SA Water, ESCOSA noted that a 10-year term was consistent with the long-lived nature of the assets and with the standard commercial approach:

> *[T]he 10-year term to maturity [on CGS for the risk-free rate] approximates the long-lived nature of the infrastructure assets being regulated. It is also in line with the term used by regulators and investment practitioners, and accommodates for the relatively limited liquidity of CGS that are well beyond a 10-year term to maturity.* [29]

48. Similar reasoning was also applied by the Industry Panel that was formed to review the ICRC's 2013 decision for Icon Water. The Industry Panel adopted a 10-year term to maturity for both debt and equity on the basis that the term should approximate the life of the assets being financed. It put forward three reasons:[30]

    a The efficient debt management practice is to finance long-term assets using long-term debt. Since water utilities largely have long-lived assets, an efficient firm would seek to borrow funds with as long a term-to-maturity as possible to minimise refinancing risk;

[26] IPART, *Review of WACC Methodology, Final Report*, December 2013, pp. 12-13.

[27] QCA, *Decision – Queensland Rail 2020 draft access undertaking*, February 2020, p. 41-42.

[28] QCA, *Decision – Queensland Rail 2020 draft access undertaking*, February 2020, p. 41-42.

[29] ESCOSA, *SA Water regulatory determination 2020 – Final determination: Statement of reasons*, June 2020, p.218.

[30] Industry Panel, *Review of the Independent Competition and Regulatory Commission's 2013 Price Determination for regulated water and sewerage services in the ACT – Draft Report*, December 2014, p.164-165.

b The expected returns on long-lived investments are more closely reflected in long-term bond yields. Evidence shows that asset-intensive firms with long-lived assets operating in a competitive market tend to raise debt with a maturity of 10 years. Financial advisers typically estimate the cost of capital using bond maturities of 10 years or longer. From investors' perspectives, those seeking to invest in asset intensive firms usually have investment and financing horizons much longer than the standard 5-year regulatory period; and

c The term-to-maturity of the risk-free rate used in the calculation of the cost of debt should be consistent with the assumption used when calculating the cost of equity. In this regard, the Industry Panel noted:

When calculating the cost of equity, companies and financial analysts usually adopt a 10-year government bond yield as the risk-free rate and that the calculation of the MRP is also usually estimated by reference to a 10-year government bond yield. [31]

49. In all subsequent decisions, the ICRC has followed the Industry Panel and applied a 10-year term for both debt and equity.

Regulators overseas adopt a risk-free term of at least 10 years

50. Where longer term government bond yields are available, regulators tend to adopt a risk-free rate with a longer term. For example, a number of regulators overseas use 15-year, or 20-year, or 30-year risk-free rates. The New Zealand Commerce Commission was the only regulator overseas that was considered in the AER's recent working paper that uses a 5-year risk-free rate.[32]

51. UK regulators use government bonds with terms greater than 10 years as a proxy for the risk-free rate. For example, in its most recent decision, Ofwat considered 10-year and 20-year government bonds:

We considered evidence from both nominal and RPI linked gilt yields at 10 and 20 year maturities to construct estimates of the risk-free rate at our chosen 15-year investment horizon. [33]

52. In its recent review of Ofwat's PR19 decision, the UK Competition and Markets Authority considered a range of evidence with terms between 10 and 20 years:

We set the bottom of the RFR estimate range as the 6-month average of the UK 20-yr ILG. We set the top of the range as the 6-month average of the IHS iBoxx £ Non-Gilt AAA 10+ and 10-15 indices.[34]

53. In its most recent decision, Ofgem considered a number of government bond yield estimates, all with terms of 20 years, noting that:

The CAPM allows us to estimate investor expectations by combining three parameters (the risk-free rate, equity beta, and Total Market Returns). In line with recommendation 2 from the UKRN

[31] Industry Panel, *Review of the Independent Competition and Regulatory Commission's 2013 Price Determination for regulated water and sewerage services in the ACT – Draft Report*, December 2014, p.165.

[32] AER, May 2021, Term of the rate of return: Draft working paper, Table 2, p. 21.

[33] Ofwat, *PR19 Final Decision, p. 29.*

[34] UK CMA, *PR19 Final Decision, Paragraph 9.241.*

> *Study, we estimate each of these three parameters using long-term tenors or long-runs of outturn data.* [35]

54. In the US, Federal Energy Regulatory Commission (FERC) adopts the yield on 30-year US Treasury bonds[36] and Surface Transportation Board (STB) adopts the yield on 20-year US Treasury bonds.[37]

2.7 The basis of the 'term-matching' approach

The origins of the term-matching approach

55. The approach of setting the term of the risk-free rate to match the length of the regulatory period was first advocated in an academic paper by Lally (2004).[38] That paper contains a detailed algebraic derivation that is based on the assumption that the market value of the regulated asset at the end of the regulated period is known with certainty at the beginning of the regulatory period. The algebraic derivations show that, under the assumption of a known end-of-period market value, setting the term of the risk-free rate equal to the length of the regulatory period would comply with the NPV=0 principle.

56. As we demonstrate below, the key problem with this analysis is that the end-of-period market value is *not* known with certainty, so the algebraic derivations do not follow.

57. Dr Lally has since provided a series of submissions to a number of Australian regulators, particularly the AER and QCA, advocating the 'term matching' approach to the risk-free rate, and we consider the evolution of these submissions below.

Reliance on a known end-of-period market value

58. In his 2012 advice to the AER, Dr Lally was clear about his assumption that the market value of the firm at the end of each regulatory period is known with certainty at the beginning of each regulatory period:

> *…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* [39]

such that the:

> *…payoffs at time 4 [the end of the regulatory period in his example] are **certain**.*[40]

59. It is this assumption that is critical to Dr Lally's conclusion that the term of the risk-free rate should be matched to the length of the regulatory period; without this assumption, Dr Lally's key conclusion would not be obtained.

60. In a 2013 report for the QCA, Dr Lally explained further that, because the end of period market value is certain, the current value of the firm can be computed as the present value of the allowed cash flows throughout the regulatory period plus the known market value at the end of the regulatory period. In this context, there is no need to consider any cash flows beyond the end of

[35] Ofgem, *RIIO -2 Decision, Paragraph 3.11.*

[36] The Brattle Group, *A Review of International Approaches to Regulated Rates of Return*, June 2020, pp. 86, 93.

[37] The Brattle Group (2020), p. 99.

[38] Lally, M., 2004, 'Regulation and the Choice of the Risk Free Rate', *Accounting Research Journal*, vol. 17 (1), pp. 18-23.

[39] Lally, M. August 2012, The risk free rate and the present value principle, p. 14, emphasis added.

[40] Lally, M. August 2012, The risk free rate and the present value principle, p. 10, emphasis added.

the current regulatory period, because their value is encapsulated in the known market value of the firm at the end of the regulatory period:

> *At the end of the first year [the end of the regulatory period in his example], the regulated business will therefore receive V1 = $50m plus revenues to cover regulatory depreciation of $50m and the cost of capital for the first year of $100m(.05).* ***Since this sum is known at the beginning of the first year*** *it can be valued using the prevailing risk-free rate.*[41]

The AER's rejection of Dr Lally's certainty assumption

61. The AER's 2013 Rate of Return Guideline Explanatory Statement noted correctly that the Lally NPV=0 argument rests on the assumption that the end-of-period value is known from the outset, and that such an assumption may be violated in practice:

> *…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****.*[42]

62. This was one of the reasons stated by the AER for rejecting Dr Lally's recommendation of a 5-year risk-free rate.

63. The AER's 2018 RoRI Explanatory Statement also notes that the Lally NPV=0 argument rests on the assumption that the end-of-period value is known from the outset, and that such an assumption may be violated in practice:

> *…the issue with using a term equal to the length of the regulatory control period, is it requires the assumption that the full recovery of the residual value of the RAB (in cash) at the end of the term is guaranteed. The ability of regulated businesses to over or under perform their allowed rate of return and other allowances, and the volatility of the stock market make it difficult to say whether (and to what extent) Lally's assumptions would hold in reality.*
>
> *The uncertainty in the initial investment being (fully) recoverable was also highlighted by the ENA, in a report produced by Incenta:*
>
> *…investors are unlikely to evaluate regulated assets with reference to a five year bond because – unlike the case of the bond – the residual value at the end of each five 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).*
>
> *Based on the evidence before us, we consider it reasonable to use a 10 year term rather than move to a 5 year term.* [43]

Response of Dr Lally to the AER's 2018 critique

64. In a recent report to the AER, Lally (2021)[44] begins with a restatement of Dr Lally's previous advice in which the market value of the firm at the end of the regulatory period is *assumed* to be known with certainty at the beginning. This is set out in Equation 4 (p. 8) where V_1 (the market value of the

[41] Lally, M., October 2013, *Response to submissions on the risk-free rate and the MRP, Report for the Queensland Competition Authority*, p. 47, emphasis added.

[42] AER, August 2013, *Better regulation – Explanatory statement: Draft rate of return guideline*, p. 183, emphasis added.

[43] AER, December 2018, Rate of Return Instrument, Final Decision, Explanatory Statement, p. 130, emphasis added.

[44] Lally, M., May 2021, The appropriate term for the allowed cost of capital.

firm at the end of the regulatory period) is assumed to be known to be equal to the RAB at that time.

65. Dr Lally then contests the AER's previous rejection of that assumption as follows:

> *In response to this kind of reasoning in Lally (2012), the AER (2018, page 130) asserts that this reasoning assumes recovery of the asset book value in cash at the end of the first regulatory period. No such assumption appears in equation (4); to the contrary, the equation explicitly recognizes that the payoff at the end of the first regulatory period is the market value then of the business and that this would equal the contemporaneous regulatory book value of its assets.*[45]

66. That is, Dr Lally concedes that he has assumed that the market value of the asset must with certainty equal the RAB at the end of the regulatory period, but queries whether this certain value would be available in the form of "cash." The form in which this value might be available, however, is irrelevant. The problem is with the assumption that the market value of the business "would equal the contemporaneous regulatory book value of its assets," which is precisely the content of Equation 4 in Lally (2021).

67. The report from Dr Lally then goes on to say that:

> *The AER (2018, page 130) also suggests that the above proof assumes that the value of the regulated assets at the end of the current regulatory period is known now for certain, and asserts that this is not true because of volatility in the stock market. However nothing in the above proof precludes the fact that the values of other assets are volatile.* [46]

68. This contention also appears to miss the central element of the AER's concern. The volatility of other assets is irrelevant in this case. The AER's point is that there can be no guarantee that the equity of a regulated firm, which trades on the stock market, will precisely equal the RAB at the end of each regulatory period – as the derivations in Dr Lally's report assume.

Dr Lally's 2021 position on end-of-period market values

69. Dr Lally's 2021 report to the AER acknowledges that, in reality, the market value of the firm may differ from the RAB – due, the report contends, to errors made by the AER:

> *Nevertheless, it is possible that the value of the regulatory assets at the end of the first regulatory cycle (V_1) may not be equal to the contemporaneous regulatory book value of the assets, because the regulator may err at time 1 in setting the revenues for the second regulatory cycle, and this possibility has not been recognized in equation (3) in the above analysis.* [47]

70. The report goes on to conclude that Dr Lally's previous conclusions still follow so long as investors expect the market value of the firm to equal the RAB at the end of each regulatory period.[48]

71. The basis of Dr Lally's previous positions is that the market value of the regulated firm is certain to equal the RAB at the end of each regulatory period. In this case, there is no need to contemplate any cash flows beyond the end of the regulatory period and the firm can be valued as the sum of the present values of the net cash flows during the regulatory period and the RAB at the end of the

[45] Lally, M., May 2021, The appropriate term for the allowed cost of capital, pp. 8-9.

[46] Lally, M., May 2021, The appropriate term for the allowed cost of capital, pp. 8-9.

[47] Lally, M., May 2021, The appropriate term for the allowed cost of capital, p. 9.

[48] Lally, M., May 2021, The appropriate term for the allowed cost of capital, p. 9.

regulatory period. Since these cash flows cover a five-year period, they can be discounted using a 5-year rate.

72. The reality is that the market value of the regulated firm is not equal to the RAB at the end of every regulatory period, so investors do not value regulated firms in accordance with the methodology within the formulas in Dr Lally's report. In particular, the value of the firm at the end of the regulatory period will not be assumed to be equal to the RAB,[49] but will instead reflect the present value (at that time) of all expected future cash flows. It is for this reason that investors value regulated firms by forecasting cash flows many years into the future and by discounting those long-lived cash flows using a long-term discount rate. For example, it is well-known that the investor bid models for the NSW network assets were structured in this way, as are the calculations of the values of unlisted networks that are performed from time to time.

73. Dr Lally (2021) proposes that the expected market value of the firm is equal to the RAB at the end of each regulatory period. Dr Lally suggests that, under this new assumption, it would again be possible to value the regulated firm as the sum of the present values of the net cash flows during the regulatory period and the RAB at the end of the regulatory period – the only difference being that a higher discount rate would now be required to reflect the possibility that the value at the end of the regulatory period may turn out to differ from the RAB.

74. That is, the only change to Dr Lally's previous advice and papers is that the (known) end-of-period RAB now represents the expected present value (as at that time) of all future cash flows, rather than the certain present value (as at that time) of all future cash flows. There would still be no need to contemplate any cash flows beyond the end of the current regulatory period.

75. However, there are some fundamental problems with this new proposal:

    a The new assumption is as implausible as the one it replaces

    Investors do not expect the market value of the firm to equal the RAB at the end of each regulatory period. Indeed, no one expects that as there is no real-world basis for such an expectation. The proposition that investors would always expect the market value of the regulated firm to be equal to the RAB at the end of every regulatory period is just as implausible as the previous assumption that investors know the market value is equal to the RAB at the end of the regulatory period. Indeed, the well-known approach of investors is to forecast the future cash flows of the business and to discount those cash flows using the long-term discount rate that is deemed to be appropriate as at the date of the valuation. There is no reason to expect that this exercise would produce a market value equal to the RAB at the end of each regulatory period.

    Indeed, the RAB itself is not known with certainty at the end of each regulatory period as the amount of actual capital expenditure, and the regulatory acceptance of any overspend, is uncertain.

    Moreover, the whole basis of an incentive-based regulatory regime is to encourage businesses to outperform quality and efficiency benchmarks. An investor who was anticipating any out-performance or under-performance after the valuation date would not expect the market value of the firm to equal the RAB.

    Dr Lally's assumption also requires that investors expect the regulatory allowance in all future periods to precisely equal their required return, or that any discrepancies have an

[49] More specifically, the market value of equity in the firm is not certain to be equal to equity's share of the RAB at the end of the regulatory period.

NPV of zero. Note that Dr Lally's assumption is not that the AER seeks to set regulatory allowances in an unbiased manner, or even that it does set allowances in an unbiased manner. Rather, his assumption is about what investors expect.

b The 'floating rate bond' analogy does not work

As noted above, Dr Lally's previous analyses have been based on the notion that the regulated firm can be valued like a 5-year bullet bond – whereby the owner receives a payment each year and a guaranteed value (equal to the RAB) at the end of the fifth year.

Dr Lally now recognises that the certainty assumption does not hold and instead suggests that:

[T]he valuation problem for a regulator is like that for an unregulated business terminating in five years' time, or a floating rate bond whose coupon rate is reset every five years. [50]

However, even if the regulated asset could be considered to be a perpetual bond with 5-yearly rate resets, that would not imply that the prevailing 5-year rate should be used when determining the required return. This is because a perpetual bond with 5-yearly resets would be priced at a material margin above the prevailing 5-year spot rate. Failing to reflect this margin in the cash flows, which is the outcome under term-matching, will produce a negative NPV, violating the NPV=0 principle.

c Regulated firms are not valued the way Dr Lally's report assumes

Under Dr Lally's new assumption, regulated firms could be valued by summing the present values of the remaining net cash flows of the current regulatory period and the end-of-period RAB.

However, it is well-known that investors do not value regulated firms in that way. That is, investors clearly do not think it reasonable to assume that the expected market value of the firm is equal to the RAB at the end of the regulatory period when valuing assets or determining required returns.

d The new approach in Lally (2021) would require an uncertain and immeasurable adjustment to beta

Dr Lally notes that his new approach would require a higher discount rate to reflect any systematic component of the risk that the value of the firm might differ from the RAB at the end of each regulatory period. It is not clear how that risk would be quantified in the case of a regulator that revises its approach to setting allowed returns every four years.

76. In our view:

a The Lally term-matching approach relies on the assumption that the market value of the regulated asset is known with certainty at the beginning of the regulatory period. Since that assumption does not hold in practice, the algebraic derivations that are based on it are not relevant to the regulatory task; and

b The violation of the 'certainty' assumption cannot be avoided by replacing it with an assumption in relation to investor expectations – the algebraic derivations require certainty; and

[50] Lally, M., May 2021, The appropriate term for the allowed cost of capital, p. 3.

c In any event, the term of the risk-free rate should be set according to the return that investors do require (which is clearly based on a 10-year risk-free rate), not according to the return that Dr Lally's theoretical framework suggests they should require, on the basis of his assumptions and derivations.

2.8 Recent AER summary of potential reasons to support a term-matching approach

Overview

77. The AER's recent working paper[51] sets out a number of reasons that could be advanced to support a term of equity that matches the length of the regulatory period – drawn from the AER's review of other regulators' practice and expert reports. This represents a current summary of all of the reasons that could be adduced to support the use of a 5-year term (assuming a 5-year regulatory period, which might be not the case).[52] Each of those reasons are addressed below.

Reason 1: Term matching satisfies the NPV=0 condition

78. We make the following observations in relation to the claim that term matching satisfies the NPV=0 condition:

a Section 2.4 above establishes that the adoption of a 10-year risk-free rate, reflecting the approach that investors take when determining their required return on long-lived assets, is consistent with the AER's 2018 definition of the NPV=0 principle and (viewed through the NPV=0 lens) the AER has concluded that this contributes to achieving the NEO and NGO. We agree with the AER's analysis on this point in the 2018 RoRI and notes that there have been no subsequent changes to either the NPV=0 principle or the NEO/NGO.

b Section 2.6 above explains why the various algebraic derivations in the Lally reports do not establish that term matching is required to support the NPV=0 principle – even if one accepts the implausible assumptions on which those derivations are based.

c In our view, the NPV=0 principle, and the NEO and NGO, are best achieved by setting the allowed return on equity such that:

there is just enough cash flow left over to cover investors' required return on the capital invested.[53]

Since there is clear evidence of:

support for using a 10 year term in actual investor valuation practices[54]

it follows that a 10-year term would be consistent with the NPV=0 principle. That is, the NPV=0 principle simply requires the regulator to set the allowed return to reflect the

[51] AER, May 2021, Term of the Rate of Return: Draft Working Paper, pp. 38-43.

[52] Our understanding is that no pricing period is prescribed for the Pilbara networks; 5 years is the maximum term permitted, but network businesses might use a shorter period. The ERA's term matching approach could only be implemented if the pricing period is known in advance with certainty.

[53] AER, December 2018, Rate of Return Instrument, Final Decision, Explanatory Statement, p. 35.

[54] AER, December 2018, Rate of Return Instrument, Final Decision, Explanatory Statement, p. 127.

rates in the market for capital finance [55]

because:

efficient financing costs are reflected in the prevailing market cost of capital. [56]

It is therefore critical to recognise that adopting a 10-year term does not violate the NPV=0 principle. Rather, adopting a 10-year term satisfies the NPV=0 principle.

A 5-year risk-free rate is not used by investors, it does not reflect the rates in the market for capital finance nor the prevailing market cost of capital. Consequently, a 5-year term should not be adopted for the risk-free rate. Doing so would violate the NPV=0 principle because a 5-year term assumption would produce an allowed rate of return that is inconsistent with the return actually required by equity investors.

Reason 2: The yield curve is upward-sloping

79. The second reason identified by the AER is that the yield curve is upward-sloping. This appears to be another way of re-stating the NPV=0 argument above – if the 5-year rate should be used, but the (higher) 10-year rate is adopted, investors would be over-compensated.

80. The response to this argument is that the 10-year rate should be used because that reflects "rates in the market for capital finance" and consequently "efficient financing costs" as explained above. That is, the use of a 10-year rate would not over-compensate investors because it would just match their required return.

81. An upward-sloping yield curve is irrelevant—except to the extent that using a 5-year rate, when a 10-year rate ought to be used instead, would result in *under-compensation* of investors.

82. We note that the ERA made precisely this point in its 2018 and 2019 WACC for WA rail networks:

> *The use of a risk free rate with a term less than the life of a rail asset may create a downward bias, given an upward sloping yield curve.* [57]

83. This argument highlights a difference between the return that investors do require (which is clearly based on a 10-year risk-free rate) and the return that Dr Lally suggests they should require, based on certain assumptions and derivations. That is, the suggestion is that a 5-year return should be adequate, so the requirement of a 10-year return is excessive. It is the return that investors do require that is relevant to the implementation of the regulatory task.

84. It is also relevant to note here that the regulator determines the allowed return on equity at the beginning of each regulatory period. Part of that return is provided to equity holders during the regulatory period and the remainder is provided over the remaining life of the assets, as RAB indexation produces future regulatory allowances.[58] Thus, the value of the firm always depends on the long-run expected future cash flows.

85. Finally, we note that, under the SL CAPM, there is no yield curve because the CAPM is a one-period model. That is, under the SL CAPM there can be no difference between the 5-year and 10-year

[55] AER, December 2018, Rate of Return Instrument, Final Decision, Explanatory Statement, p. 33.

[56] AER, December 2018, Rate of Return Instrument, Final Decision, Explanatory Statement, p. 33.

[57] ERA, August 2019, *Final Determination, 2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks, and the Pilbara Railways*, p. 21.

[58] In some recent AER decisions, none of the return on equity is provided during the regulatory period; all of it coming over the remaining life of the assets via the effects of RAB indexation.

rates because there cannot be two 5-year periods for investors to consider. We consider it to be unsafe and conceptually flawed to use a feature that is assumed away by a model to determine how that model should be implemented. Of more relevance is how the model is actually implemented in practice, and the evidence on that point (as set out above) is clear.

Reason 3: The allowed return on equity is akin to a floating rate bond with 5-yearly resets

86. This appears to be another way of restating the two arguments above. The AER's working paper notes that the basis of this argument is that Dr Lally "advised that the correct discount rate to use would be the five-year rate because that was the length of the regulatory period."[59, 60]

87. The point here appears to be, again, that there is a difference between the return that investors do require (which is clearly based on a 10-year risk-free rate) and the return that Dr Lally suggests they should require, based on assumptions and derivations.

88. We disagree with the proposition that the allowed return on equity is akin to a floating rate bond with 5-yearly resets. Dr Lally's explanation of this point (pp. 20-21) restates the central point in all of his previous submissions to the AER. Under the assumptions in Dr Lally's report, the value of the regulated firm as at the end of the regulatory period, is known with certainty from the beginning of the regulatory period. Consequently, there is no reason to consider any cash flows beyond the current regulatory period.

89. We agree with the AER's previous analysis that the end-of-period market value of the firm is not known with certainty, and consequently derivations that are based on that assumption are not useful.

90. It is also not the case that the allowed return on equity is provided as a series of cash flows during the regulatory period. Rather, as explained above, only a portion of the allowed return on equity is provided during the current regulatory period. The balance of the allowed return on equity is provided over the course of the remaining life of the assets and will depend on the level of the regulatory allowance in each of those future periods. This is quite unlike a floating rate bond with 5-yearly re-sets.

91. As noted above, even if the regulated asset could be considered to be a perpetual bond with 5-yearly rate resets, that would not imply that the prevailing 5-year rate should be used when determining the required return. This is because perpetual bonds with 5-yearly resets are priced at a yield that is materially higher than the prevailing 5-year spot rate.

Reason 4: The New Zealand Commerce Commission (NZCC) uses a 5-year risk-free rate

92. The AER identifies the NZCC as a single regulator overseas that adopts a 5-year risk-free rate. As noted in Section 2.6 above, the standard approach among international regulators is to adopt a risk-free rate with a term of 10 years or even longer. Thus, a review of the practice of other comparable regulators would appear to be an argument against a 5-year risk-free rate.

93. Moreover, the NZCC sets the allowed return on capital at the 67th percentile of its WACC distribution. This system of setting the allowed return above the mid-point estimate is a key part of the New Zealand regulatory framework, and has the effect of lifting the 'effective' risk-free rate (along with other WACC parameters).

[59] AER, May 2021, Term of the Rate of Return: Draft Working Paper, p. 30.

[60] As noted above, there is no fixed regulatory period for the Pilbara networks—only a *maximum* pricing term of five years.

Reason 5: There is a difference between market practice and the regulatory task

94. This is another way of re-stating the argument that the term of the risk-free rate should not be set according to the return that investors do require (which is clearly based on a 10-year risk-free rate), but rather according to the return that Dr Lally's theoretical framework suggests they should require, based on assumptions and derivations.

95. In our view, the AER was correct in its 2018 assessment of the regulatory task in relation to this issue, as summarised in Section 2.4 above. We agree with the AER's conclusion that:

> *In this context, for the allowed rate of return to contribute to the achievement of the legislative objectives **it should reflect the efficient cost of capital**. If it does, then it will (all else equal) promote both efficient investment in, and efficient use of, energy network services.*
>
> *An allowed rate of return that reflects the efficient market cost of capital will promote both investment and consumption efficiency.* [61]

96. We agree that the Revenue and Pricing Principles and NEO and NGO are best promoted by setting the allowed return to be commensurate with the efficient market cost of capital – the return that real-world market investors require. Since there is very clear evidence that real-world market investors determine required returns with reference to a 10-year risk-free rate, that is the approach that should be used to set regulatory allowances. That is, when real-world investors perform marking-to-market valuations, they do so by forecasting future cash flows and discounting at a 10-year (or longer) rate.

97. We note that section 57(2) of the Pilbara Networks Access Code provides that the ERA must determine a rate of return for Horizon Power that must:

> *be commensurate with the regulatory and commercial risks involved in providing covered services;*

98. In our view, this requirement means that the ERA should consider the practice of real-world investors when they determine their required commercial rate of return.

99. The way investors value regulated networks illustrates that market practice is precisely aligned with the regulatory task. Specifically, investor valuation models typically forecast the AER's regulatory allowances over many future regulatory periods. That is, investors forecast AER regulatory allowances and then discount those cash flows at what they consider to be an appropriate rate of return. The AER's task is to set regulatory allowances for each year and the market practice is to estimate the present value of those same regulatory allowances.

100. Moreover, the AER's working paper also states that:

> *The uncertainty with the value of an asset at the end of its life is mentioned as a reason against matching the term of equity to the length of the regulatory period. However, we note that capital expenditure (once approved) is added to the RAB. It is shielded from writedowns and allow the return of capital (depreciation), return on capital and associated operating expenditure. Therefore, investors can reasonably expect that they will be able to recover their investment over the life of the assets.*[62]

[61] AER, December 2018, Rate of Return Instrument, Final Decision, Explanatory Statement, p. 44, emphasis added.

[62] AER, May 2021, Term of the Rate of Return: Draft Working Paper, p. 43.

101. This does not imply that investors would be certain, or would expect, that the market value of the firm is equal to the RAB at the end of each regulatory period. Rather, investors take all of the relevant features of the regulatory regime into account when forecasting future cash flows over the long-term future. That is, market investors do not stop forecasting cash flows at the end of the regulatory period because they do not consider the end-of-period RAB to be a relevant estimate (neither certain nor expected) of the market value of the firm at that time.

Reason 6: Court and tribunal judgments

102. The AER's working paper notes that various courts and tribunals in a range of jurisdictions have held that it is open to regulators to adopt a 5-year risk-free rate.[63] Of course, the same can be said about a 10-year risk-free rate. In our view, this provides no useful guidance. The issue here is which term produces the best estimate of the efficient cost of capital.

103. Moreover, regardless of what various courts and tribunals have determined is open to a regulator, it is an unambiguous fact that all regulators in Australia, apart from the ERA (when regulating electricity and gas networks), have chosen to adopt a 10-year term, and several have switched deliberately from the use of a 5-year term to a 10-year term once they have considered carefully the arguments for and against each of those options.

2.9 Our recommendation

104. Our recommendation is that a 10-year term should be adopted for the risk-free rate. The primary reasons for that conclusion are:

    a The use of a 10-year rate reflects the standard practice adopted by market investors, valuation professionals and academic and practitioner textbooks;

    b The NPV=0 principle requires that the regulatory allowance is set to match the return that investors require – which is based on a 10-year risk-free rate;

    c Every other Australian regulator now uses a 10-year risk-free rate, matching the regulatory approach with the approach adopted by market investors. It is now the case that:

        i No other Australian regulator adopts a 5-year risk-free rate; and

        ii No other Australian regulator considers that the NPV=0 principle prevents it from adopting a 10-year risk-free rate, consistent with market practice;

    d The set of algebraic derivations produced in Lally (2004) and subsequent submissions from Dr Lally have been widely rejected because:

        i Those derivations rely on the assumption that, with certainty, the market value of the regulated asset will equal the RAB at the end of the regulatory period. Since that assumption does not hold in practice, the algebraic derivations that are based on it are not relevant to the regulatory task; and

        ii In any event, the term of the risk-free rate should be set according to the return that investors do require (which is very clearly based on a 10-year risk-free rate),

[63] AER, May 2021, Term of the Rate of Return: Draft Working Paper, p. 43.

not according to the return that Dr Lally's theoretical framework suggests they should require, on the basis of his assumptions and derivations.

3 The trailing average approach to the allowed return on debt

3.1 Overview and conclusions

105. The ERA's current approach to the allowed return on debt reflects a financing strategy whereby:

    a The benchmark firm issues 10-year floating rate debt on a staggered maturity basis (i.e., refinancing 10% of its debt portfolio each year); and

    b Uses interest rate swaps to lock in the base risk-free rate at the beginning of each regulatory period.

106. In practice, no firm would adopt such a financing approach unless it was trying to create a match between its actual financing costs and the ERA's regulatory allowance for the return on debt. No infrastructure business that is not regulated by the ERA would consider adopting the financing strategy that underlies the ERA's allowance. Consequently, it is difficult to support the notion that such a strategy is prudent and efficient.

107. In our view, the ERA's reasoning that the current approach "best approximates the NPV=0 principle" is incorrect for the reasons identified above in relation to term issues. In particular, the NPV=0 principle requires that the regulatory allowance is set equal to the efficient cost – no more and no less. If it is prudent and efficient to issue 10-year fixed-rate debt on a staggered maturity basis, the regulatory allowance should reflect the cost of that strategy.

108. Every other Australian regulator now uses the standard 10-year trailing average approach applied to the entire return on debt (i.e., both the base rate and debt risk premium components), matching the regulatory approach with the approach generally observed in the market. It is now the case that:

    a No other Australian regulator adopts the ERA's hybrid approach; and

    b No other Australian regulator considers that the NPV=0 principle prevents it from adopting the standard 10-year trailing average approach.

109. For the reasons set out above, our recommendation is that the allowed return on debt should be set using the standard 10-year trailing average approach adopted by all other Australian regulators.

3.2 The ERA's current approach

110. The ERA currently adopts a hybrid approach to the allowed return on debt. The ERA's 2018 Rate of Return Guideline sets the allowed return on debt as the sum of:

    a The prevailing 5-year bank bill swap rate (20-day averaging period prior to the start of the regulatory period);

    b A 10-year trailing average of the debt risk premium, computed relative to the 5-year bank-bill swap rate, updated for each year of the regulatory period; and

c An annual allowance for debt raising and hedging costs. [64]

111. The ERA has summarised its reasoning for this approach as follows:

> *The ERA considers that this return on debt approach best approximates the NPV=0 principle while also recognising interest rate risk, refinancing risk and the staggered nature of debt portfolios.* [65]

112. The assumed financing strategy that underlies this allowance is one where:

a The benchmark firm issues 10-year floating rate debt on a staggered maturity basis (i.e., refinancing 10% of its debt portfolio each year); and

b Uses interest rate swaps to lock in the base risk-free rate at the beginning of each regulatory period.

3.3 The approach of all other Australian regulators

113. All other Australian regulators now adopt a 10-year trailing average approach applied to the total yield on debt – rather than applying the trailing average to the debt risk premium only.

114. Under this approach, the regulator records the yield on 10-year debt with the appropriate credit rating during a specified averaging period each year. The regulatory allowance for each year is then set as the average over the 10-year period that ends with the current figure. There is no separate estimation of risk-free or base rates and debt risk premiums, just a simple trailing average of the relevant yield.

115. The assumed financing strategy that underlies this approach is one where the benchmark firm simply issues 10-year fixed-rate debt on a staggered maturity basis. Each year, 10% of the debt portfolio matures and is refinanced with a new tranche of 10-year fixed-rate debt.

116. In its recent rate of return methodology review, the QCA summarised the approaches of Australian regulators, reproduced in **Figure 2** below.

[64] ERA, 2018 Rate of Return Guideline Final Decision, section 7.6.4, pp. 91-92.

[65] ERA, 2018 Rate of Return Guideline Final Decision, paragraph 544.

Figure 2: Australian regulatory approaches to the term of the risk-free rate

Regulator	*Application of the trailing average approach*
AER	Entire cost of debt
ESC	Entire cost of debt
IPART	Entire cost of debt
ESCOSA	Entire cost of debt
ERA (electricity)	DRP only
OTTER	Entire cost of debt
ICRC	Entire cost of debt

Source: QCA, June 2021, Rate of return review, Table 8, p. 35.

117. In summary, it is now the case that:

    a No other Australian regulator adopts the ERA's hybrid approach; and

    b No other Australian regulator considers that the NPV=0 principle prevents it from adopting the standard 10-year trailing average approach.

3.4 The rationale for the standard trailing average approach

Overview

118. All other Australian regulators now adopt the standard 10-year trailing average approach on the basis that it best reflects the cost that would be incurred under a prudent and efficient debt management approach. In this sense, it achieves the key regulatory objective of matching the regulatory allowance to the benchmark efficient cost.

119. In particular, long-lived infrastructure assets tend to be financed with long-term fixed-rate debt on a staggered maturity basis. The standard trailing average approach reflects the cost of servicing debt under that approach.

The genesis of the trailing average approach in Australian regulatory determinations

120. The idea of the trailing average approach to debt was first introduced in Australia through an Australian Energy Markets Commission (AEMC) Rule Change process, which concluded in November 2012. The proponents of this change to the National Electricity Rules (NER) and the National Gas Rules (NGR) were the AER and the Energy Users Rule Change Committee (EURCC), which represented a number of large energy consumers in Australia.

121. The AER and the EURCC expressed concern during the Rule Change process that the then rate-on-the-day approach[66] was not producing an appropriate estimate of the return on debt for a benchmark efficient entity. Specifically, the proponents noted that:

[66] That is, the approach of setting the allowed return on debt equal to the relevant yield observed at the time of each regulatory determination.

a Prudently-managed infrastructure businesses, including regulated networks, do not refinance all their debt at once, as the rate-on-the-day approach assumes. Rather, debt financing is staggered so as to minimise refinancing risk;

b As such, the debt held by a regulated network at any point of time is a mixture of debt raised in the past (that is due to mature in the near future) and debt raised more recently (that will mature further into the future);

c Consequently, the cost of servicing debt that is faced by regulated businesses is also a mixture of historical and recent interest rates – those that applied when each tranche of the debt that is currently on the firm's books was issued; and

d At the time the AER was resetting prices for many energy networks in 2008 and 2009, the rate-on-the-day cost of corporate borrowing had risen steeply as a consequence of the global financial crisis (GFC). However, the bulk of the debt held by those networks had been raised at significantly cheaper pre-GFC rates as part of the standard approach of staggering debt issuances. Hence, there was a significant divergence between the actual (efficient) debt service costs faced by regulated networks at the time and the allowed return on debt (determined using the rate-on-the-day approach, whereby the prevailing high rate was applied to the firm's entire debt portfolio).

AER observations

122. The first Australian regulator to adopt the trailing average approach was the AER in its 2013 Rate of Return Guideline. The AER was clear that the benefits of the trailing average approach it had identified would flow to both the regulated businesses and to customers:

> *We propose to apply a trailing average portfolio approach to estimate the return on debt. This approach means that the allowed return on debt* ***more closely aligns with the efficient debt financing practices*** *of regulated businesses and means that* ***prices are likely to be less volatile over time****. The trailing average would be calculated over a ten year period. The annual updating of the trailing average should also reduce the potential for a mismatch between the allowed return on debt and the return on debt for a benchmark efficient entity. This should* ***reduce cash flow volatility*** *over the longer term.*[67]

123. That is, the AER noted two key benefits of the trailing average approach:

a It would result in a better match between the regulatory allowance and the efficient cost of debt; and

b It would result in lower year-to-year volatility in allowed returns, and consequently prices paid by consumers.

ESCOSA observations

124. The benefits identified by the AER were echoed by ESCOSA, which concluded that the trailing average approach would:

a Result in a better matching of the regulatory allowance to the efficient debt management practices of regulated utilities (because the regulatory allowance under such an approach could be replicated by businesses that manage their debt in an efficient and prudent way);

[67] AER Rate of Return Guideline – Explanatory Statement, December 2013, p.12, emphasis added.

b Provide SA Water with a reasonable opportunity to earn sufficient revenue to attract equity and debt needed to finance regulated services; and

c Achieve greater price stability for the benefit of customers.

125. ESCOSA stated the following in relation to its recent proposal to adopt the trailing average approach:

> *The proposed approach involves setting a ten-year trailing average cost of debt, updated annually during the regulatory period to reflect prevailing rates. This recognises the historic costs of debt incurred over a ten year period, while also encouraging efficient new investment through the annual update, consistent with the "new entrant" approach.*
>
> *It explicitly recognises that it is prudent and efficient for a large water and sewerage business, such as SA Water, to enter into long-term debt financing arrangements given the long-term supply obligations and long asset lives that the business must invest in.*
>
> *The approach is expected to reduce risk and therefore costs to consumers in the long-term, bearing in mind the nature and scale of the regulatory obligations and the regulated entity.*
>
> *The proposed approach is also increasingly becoming standard regulatory practice within Australia for application in industries such as energy and water, where the regulated businesses generally have significant debt requirements, long-term supply obligations and long asset lives. It has been adopted or endorsed by other jurisdictional and national regulatory and policy bodies over the past three years.*
>
> *It is also consistent with observed financing practices of large infrastructure businesses and with the requirements of the National Water Initiative (Principle 1 of the NWI Principles for the recovery of capital expenditure) and the overarching statutory framework under the Water Industry Act 2012.*
>
> *Under this approach, SA Water is incentivised to finance any new investments at or below the prevailing efficient market rates, meaning that consumers ultimately pay only the efficient cost of those investments. For legacy investments, the approach recognises only efficient past financing practices (not rewarding inefficient practices), encourages efficient management of the re-financing costs of those investments over time. In that way it reduces the volatility inherent in a shorter-term approach, which assumes all legacy financing costs will be re-financed at the start of each new regulatory period.*
>
> *Importantly, the proposed approach is based on an assessment of the actions of a benchmark prudent and efficient utility with the same obligations as SA Water. It does not look to the actual actions, costs or legal structure of SA Water itself.*
>
> *The approach proposed will:*
>
> - *protect consumers from any possible costs of poor financing decisions made by SA Water by providing a benchmark rate of return*
> - *provide SA Water with a reasonable opportunity to earn sufficient revenue to attract equity and debt needed to finance regulated services, and*
> - *incentivise SA Water to outperform the benchmark rate of return.*[68]

[68] ESCOSA, SA Water Regulatory Rate of Return 2016 – 2020: Final Report to the Treasurer, March 2015, pp. 3-4.

QCA observations

126. The QCA has also recently concluded that the regulatory framework first requires a decision about which debt management strategy should be adopted as the prudent and efficient benchmark:

> *Before estimating a regulatory cost of debt allowance, it is necessary to choose a benchmark debt management strategy as the basis for this estimation process.*
>
> *Once a benchmark debt management strategy has been chosen, the cost of debt (and hence a cost of debt allowance) can be estimated.*[69]

127. The QCA then notes that the trailing average approach is considered to be the appropriate benchmark because it reduces refinancing risk, as explained above:

> *It may be efficient for capital-intensive infrastructure firms to stagger their debt financing to avoid needing to refinance their entire debt portfolio over a relatively short window of time to manage refinancing risk. This has in part led many Australian regulators over the last decade to move to estimating the cost of debt using a form of trailing average debt management strategy. For example, the AER, ESC, ESCOSA and ICRC [other Australian regulators] all have recently used a trailing average cost of debt approach.*[70]

128. The QCA concludes that the trailing average approach best reflects the cost of serving debt that would be incurred by an efficient firm operating in a competitive market:

> *Therefore, when reviewing the relevant debt management strategy, we need to consider the likely debt management behaviour of an unregulated 'efficient' firm operating in a competitive market for similar services. We consider it appropriate to use this reference point, as the debt management strategy benchmark we are developing is to serve as a proxy for this hypothetical unregulated competitor—and such a competitor would have no reason to utilise an on-the-day [spot] strategy. Rather, we consider that the trailing average approach is representative of the debt management strategy adopted by a benchmark efficient firm operating in a competitive market.*[71]

Conclusions on the rationale for the standard trailing average approach

129. All other Australian regulators now adopt the standard 10-year trailing average approach on the basis that it best reflects the cost that would be incurred under a prudent and efficient debt management approach. In this sense, it achieves the key regulatory objective of matching the regulatory allowance to the benchmark efficient cost.

3.5 The ERA approach does not reflect the cost of a prudent and efficient debt management strategy

130. The ERA's current hybrid approach compensates regulated firms for the costs that would be incurred under a very specific financing strategy whereby:

a The benchmark firm issues 10-year floating rate debt on a staggered maturity basis (i.e., refinancing 10% of its debt portfolio each year); and

[69] QCA, June 2021, *Rate of return review*, p. 24.

[70] QCA, June 2021, *Rate of return review*, p. 26.

[71] QCA, June 2021, *Rate of return review*, p. 27.

b Uses interest rate swaps to lock in the base risk-free rate at the beginning of each regulatory period.

131. In practice, no firm would adopt such a financing approach unless it was trying to create a match between its actual financing costs and the ERA's regulatory allowance for the return on debt. Indeed, no other infrastructure business would ever consider adopting the financing strategy that underlies the ERA's allowance. Consequently, it is difficult to support the notion that such a strategy is prudent and efficient.

132. In our view, best regulatory practice is to set out what the regulator considers to be the prudent and efficient financing approach, and to then set the regulatory allowance to reflect the costs that would be incurred under that strategy.

3.6 The relevance of the NPV=0 principle

133. The primary rationale for the ERA's hybrid approach appears to be that the NPV=0 principle requires the term of the risk-free rate (for both equity and debt) to be set equal to the length of the regulatory period. Consequently, the discussion of the risk-free rate in the context of the return on equity above applies equally to the risk-free rate component of the return on debt.

134. In both cases, our view is that the key regulatory objective should be to match the regulatory allowance to the benchmark efficient cost. All other Australian regulators now adopt a 10-year risk-free rate because that reflects the benchmark efficient practice. And all other Australian regulators now adopt the standard trailing average approach because that reflects the benchmark efficient practice.

135. But in both cases, the ERA has been led to depart from the objective of matching the regulatory allowance to the benchmark efficient cost – due to the algebraic derivations produced in Lally (2004) and subsequent submissions from Dr Lally.

136. But, as we have noted above, the term-matching approach has been widely rejected because:

a The Lally derivations rely on the assumption that, with certainty, the market value of the regulated asset will equal the RAB at the end of the regulatory period. Since that assumption does not hold in practice, the algebraic derivations that are based on it are not relevant to the regulatory task; and

b In any event, the term of the risk-free rate should be set according to the return that investors do require (which is very clearly based on a 10-year risk-free rate), not according to the return that Dr Lally's theoretical framework suggests they should require, on the basis of his assumptions and derivations.

3.7 Our recommendation

137. Our recommendation is that the allowed return on debt should be set using the standard 10-year trailing average approach adopted by all other Australian regulators. The primary reasons for that conclusion are:

a The ERA's current approach to the allowed return on debt reflects a financing strategy that no business would ever consider adopting, other than to replicate the allowance provided to it by the ERA. Consequently, it is difficult to support the notion that such a strategy is prudent and efficient;

b The ERA's reasoning that the current approach "best approximates the NPV=0 principle" is incorrect for the reasons identified above in relation to term issues. In particular, the NPV=0 principle requires that the regulatory allowance is set equal to the efficient cost – no more and no less. If it is prudent and efficient to issue 10-year fixed-rate debt on a staggered maturity basis, the regulatory allowance should reflect the cost of that strategy.

c Every other Australian regulator now uses the standard 10-year trailing average approach applied to the entire return on debt, matching the regulatory approach with the approach generally observed in the market. It is now the case that:

   i No other Australian regulator adopts the ERA's hybrid approach; and

   ii No other Australian regulator considers that the NPV=0 principle prevents it from adopting the standard 10-year trailing average approach.

4 The market risk premium

4.1 Overview and conclusions

138. This section of the report considers three issues in relation to the estimation of the MRP:

    a We provide strong evidence that it is inappropriate to place any reliance on the geometric mean of historical excess returns. Leading textbooks and case studies prepared by Professors at Harvard, Stanford, MIT, Wharton and London Business School not only report that they recommend the use of arithmetic means, but explain why it is wrong to use a geometric mean for the purpose of estimating forward-looking expected returns. Making this change alone would increase the lower bound of the ERA's range by more than 50 basis points.

    b We also provide strong evidence to support the existence of a negative relationship between the risk-free rate and the MRP. Our view is that the required return on equity has not fallen one-for-one with the decline in government bond yields that has occurred since 2018. Rather, our view is that the evidence indicates that the MRP has increased to at least partially offset the decline in government bond yields. We note that this view is consistent with the ERA's own estimates (set out in **Table 1** below), where the forward-looking estimates of MRP have increased to partially offset the fall in risk-free rates.

    c The RBA has implemented a package of measures to help stimulate the Australian economy in response to the Covid-19 pandemic. These unprecedented market interventions by the RBA have depressed government bond yields and, therefore, regulatory estimates of the risk-free rate. Now more than ever, when the RBA's monetary policy interventions have pushed Australian government bond yields to record lows, it is imperative that the ERA recognise the likelihood of an inverse relationship between the risk-free rate and the MRP—to limit the chances that the allowed return on equity is set below the true return on equity required by investors.

139. Our key recommendations are that:

    a No weight should be applied to the geometric mean of historical excess returns; and

    b Real weight should be applied to the DGM estimate, and other approaches that allow for a negative (though not necessarily one-for-one inverse) relationship between the risk-free rate and the MRP.

4.2 The ERA's current approach

140. The ERA's current approach to the MRP is as follows:

    a Estimate the arithmetic mean of excess returns over five historical periods;

    b Estimate the geometric mean of excess returns over the same five historical periods;

    c Take the mid-point between the lowest arithmetic mean and the highest geometric mean as an estimate of the historical MRP. This becomes the lower bound of the ERA's range;

d Use the DGM to estimate the forward-looking MRP. This becomes the upper bound of the ERA's range;

e Use judgment informed by consideration of a number of conditioning variables to select a point estimate from within the range.

141. Application of this approach is summarised in **Table 1** below. That table shows:

a The historical MRP estimates are essentially constant over time, as they are based on long-term historical averages;

b The forward-looking DGM estimate has increased over time, partially offsetting the pronounced decline in the risk-free rate; and

c Although the historical MRP estimate is unchanged and the forward-looking estimate has increased materially, the adopted MRP has remained unchanged at 6.0%.

Table 1: ERA MRP estimates and allowances

	2018 Guideline	Issues Paper
Lowest arithmetic mean	6.08%	6.21%
Highest geometric mean	5.29%	5.27%
Lower bound of range (mid-point of above means)	5.7%	5.7%
Upper bound of range (DGM estimate)	7.6%	8.1%
Adopted MRP	6.0%	6.0%
Risk-free rate (5 years)	2.1%	0.6%
Total market return	8.1%	6.6%

Source: ERA, December 2018, Final gas rate of return guidelines: Explanatory statement, Section 12; RBA data; ERA, September 2021, Determination of Pilbara networks rate of return: Issues paper, Section 10.2.

142. We note that the DGM approach apparently receives very little weight in that the material increase in the DGM estimate since 2018 has had no impact on the MRP allowed by the ERA.

4.3 The use of geometric means

143. In our view, no weight should be applied to the geometric mean when using historical data to estimate a forward-looking expected return. This view is supported by very clear statements on the issue in the 2020 editions of the two leading finance textbooks.

144. The two leading finance textbooks are *Corporate Finance* by Professors Berk and DeMarzo[72] and *Principles of Corporate Finance* by Professors Brealey, Myers and Allen.[73] The current editions of

[72] Berk, J. and P. DeMarzo, 2020, *Corporate Finance*, 5th global edition, Pearson.

[73] Brealey, R., S. Myers and F. Allen, 2020, *Principles of Corporate Finance*, 13th edition, McGraw-Hill.

both contain clear explanations of why the arithmetic mean must be used, and why it is mathematically and conceptually incorrect to use the geometric mean when using historical data to estimate a forward-looking expected return.

145. Berk and DeMarzo (2020) conclude that:

> *We should use the arithmetic average return when we are trying to estimate an investment's expected return over a future horizon based on its past performance.* [74]

146. Their full explanation of why arithmetic means must be used when estimating forward-looking expected returns is set out in **Figure 3** below.

Figure 3: Why arithmetic means must be used: Berk and DeMarzo

Arithmetic Average Returns Versus Compound Annual Returns

We compute average annual returns by calculating an *arithmetic* average. An alternative is the compound annual return (also called the compound annual growth rate, or CAGR), which is computed as the *geometric* average of the annual returns $R_1, \ldots, R_T$:

$$\text{Compound Annual Return} = [(1 + R_1) \times (1 + R_2) \times \ldots \times (1 + R_T)]^{1/T} - 1$$

It is equivalent to the IRR of the investment over the period:

$$(\text{Final Value/Initial Investment})^{1/T} - 1$$

For example, using the data in Figure 10.1, the compound annual return of the S&P 500 from 1926–2017 was

$$(664{,}567/100)^{1/92} - 1 = 10.04\%$$

That is, investing in the S&P 500 from 1926 to 2018 was equivalent to earning 10.04% per year over that time period. Similarly, the compound annual return for small stocks was 12.66%, for corporate bonds was 6.06%, and for Treasury bills was 3.3%.

In each case, the compound annual return is below the average annual return shown in Table 10.3. This difference reflects the fact that returns are volatile. To see the effect of volatility, suppose an investment has annual returns of +20% one year and −20% the next year. The average annual return is $\frac{1}{2}(20\% - 20\%) = 0\%$, but the value of $1 invested after two years is

$$\$1 \times (1.20) \times (0.80) = \$0.96$$

That is, an investor would have lost money. Why? Because the 20% gain happens on a $1 investment, whereas the 20% loss happens on a larger investment of $1.20. In this case, the compound annual return is

$$(0.96)^{1/2} - 1 = -2.02\%$$

This logic implies that the compound annual return will always be below the average return, and the difference grows with the volatility of the annual returns. (Typically, the difference is about half of the variance of the returns.)

Which is a better description of an investment's return? The compound annual return is a better description of the long-run *historical* performance of an investment. It describes the equivalent risk-free return that would be required to duplicate the investment's performance over the same time period. The ranking of the long-run performance of different investments coincides with the ranking of their compound annual returns. Thus, the compound annual return is the return that is most often used for comparison purposes. For example, mutual funds generally report their compound annual returns over the last five or ten years.

Conversely, we should use the arithmetic average return when we are trying to estimate an investment's *expected* return over a *future* horizon based on its past performance. If we view past returns as independent draws from the same distribution, then the arithmetic average return provides an unbiased estimate of the true expected return.*

For example, if the investment mentioned above is equally likely to have annual returns of +20% and −20% in the future, then if we observe many two-year periods, a $1 investment will be equally likely to grow to

$$\begin{aligned}(1.20)(1.20) &= \$1.44,\\ (1.20)(0.80) &= \$0.96,\\ (0.80)(1.20) &= \$0.96,\\ \text{or } (0.80)(0.80) &= \$0.64.\end{aligned}$$

Thus, the average value in two years will be $(1.44 + 0.96 + 0.96 + 0.64)/4 = \$1$, so that the expected annual and two-year returns will both be 0%.

* For this result to hold we must compute the historical returns using the same time interval as the expected return we are estimating; that is, we use the average of past monthly returns to estimate the future monthly return, or the average of past annual returns to estimate the future annual return. Because of estimation error the estimate for different time intervals will generally differ from the result one would get by simply compounding the average annual return. With enough data, however, the results will converge.

Source: Berk, J. and P. DeMarzo, Corporate Finance, 5th global edition, Pearson, p. 368.

[74] Berk, J. and P. DeMarzo, 2020, *Corporate Finance*, 5th global edition, Pearson, p. 368.

147. Similarly, Brealey, Myers and Allen (2020) conclude as follows:

> *Moral: If the cost of capital is estimated from historical returns or risk premiums, use arithmetic averages, not compound annual rates of return.* [75]

148. Their full explanation of why arithmetic means must be used when estimating forward-looking expected returns is set out in **Figure 4** below.

Figure 4: Why arithmetic means must be used: Brealey, Myers and Allen

Arithmetic Averages and Compound Annual Returns

Notice that the average returns shown in Table 7.1 are arithmetic averages. In other words, we simply added the 118 annual returns and divided by 118. The arithmetic average is higher than the compound annual return over the period. The 118-year compound annual return for common stocks was 9.6%.[5]

The proper uses of arithmetic and compound rates of return from past investments are often misunderstood. Therefore, we call a brief time-out for a clarifying example.

Suppose that the price of Big Oil's common stock is $100. There is an equal chance that at the end of the year the stock will be worth $90, $110, or $130. Therefore, the return could be −10%, +10%, or +30% (we assume that Big Oil does not pay a dividend). The *expected* return is ⅓ (−10 + 10 + 30) = +10%.

If we run the process in reverse and discount the expected cash flow by the expected rate of return, we obtain the value of Big Oil's stock:

$$PV = \frac{110}{1.10} = \$100$$

The expected return of 10% is therefore the correct rate at which to discount the expected cash flow from Big Oil's stock. It is also the opportunity cost of capital for investments that have the same degree of risk as Big Oil.

Now suppose that we observe the returns on Big Oil stock over a large number of years. If the odds are unchanged, the return will be −10% in a third of the years, +10% in a further third, and +30% in the remaining years. The arithmetic average of these yearly returns is

$$\frac{-10 + 10 + 30}{3} = +10\%$$

Thus, the arithmetic average of the returns correctly measures the opportunity cost of capital for investments of similar risk to Big Oil stock.[6]

The average compound annual return[7] on Big Oil stock would be

$$(.9 \times 1.1 \times 1.3)^{1/3} - 1 = .088, \text{ or } 8.8\%$$

which is *less* than the opportunity cost of capital. Investors would not be willing to invest in a project that offered an 8.8% expected return if they could get an expected return of 10% in the capital markets. The net present value of such a project would be

$$NPV = -100 + \frac{108.8}{1.1} = -1.1$$

Moral: If the cost of capital is estimated from historical returns or risk premiums, use arithmetic averages, not compound annual rates of return.[8]

Source: Brealey, R., S. Myers and F. Allen, 2020, Principles of Corporate Finance, 13th edition, McGraw-Hill, pp. 169-170.

149. Other relevant evidence on this issue includes a Harvard Business School Case that compares the use of arithmetic and geometric means of historical excess stock returns. The instructor solutions

[75] Brealey, R., S. Myers and F. Allen, 2020, *Principles of Corporate Finance*, 13th edition, McGraw-Hill, p. 170.

to that case note that it is the *expected* annual return that is relevant when estimating MRP and that:

> *Students focusing on the geometric average will argue that it is the appropriate growth rate of an investment…However, the arithmetic average is a better measure of the expected return on an investment.*[76]

150. The instructor solutions then set out a number of numerical examples to demonstrate why the arithmetic mean is correct and the geometric mean is incorrect. The instructor solutions are also quite clear about which approach should be used to estimate the MRP:

> *The arithmetic average annual return is the correct measure of the expected annual return.*[77]

151. Consistent with the views of leading textbooks and HBR cases, Dr Lally has advised that the arithmetic return must be used and that the geometric return is inconsistent with the NPV=0 principle. He presents a detailed algebraic analysis to evaluate whether each form of average is consistent with the NPV=0 principle and concludes that:

> *The geometric mean fails this test whilst the arithmetic mean will satisfy it if annual returns are independent and drawn from the same distribution. So, if historical average returns are used, they should be arithmetic rather than geometric.*[78]

152. In our view, this evidence is compelling. Leading textbooks and case studies prepared by Professors at Harvard, Stanford, MIT, Wharton and London Business School not only report that they recommend the use of arithmetic means, but explain why it is wrong to use a geometric mean for the purpose of estimating forward-looking expected returns.

153. We note that, in their 2018 RoRI processes, the ERA and AER both suggested that the geometric mean might be more appropriate if the investment horizon increases,[79] citing Jacquier, Kane and Marcus (2003)[80] as support for that proposition. But this is only relevant if the regulator compounds returns over an investment horizon. But nowhere in the ERA's process does it compound any returns, so that rationale is not relevant.

154. Indeed, Dr Lally has previously explained this point, and consequently Jacquier, Kane and Marcus (2003) is not relevant because there is no compounding of returns in the Australian regulatory process:

> *The AER's belief that geometric averages are useful apparently arises from a belief that there is a compounding effect in their regulatory process (AER, 2012, Appendix A.2.1), and therefore the analysis of Blume (1974) and Jacquier et al (2003) applies. However, I do not think that there is any such compounding effect in regulatory situations and the absence of a compounding effect*

[76] HBS Marriott Corporation Case, Instructor Guide.

[77] HBS Marriott Corporation Case, Instructor Guide.

[78] Lally, M., 2012, *The cost of equity and the market risk premium*, p. 32. Moreover, historical excess returns must be independent and drawn from the same unconditional distribution to support an historical mean estimate.

[79] ERA, December 2018, *Rate of Return Instrument: Explanatory Statement*, p. 178; AER, December 2018, *Rate of Return Instrument: Explanatory Statement*, p. 90.

[80] Jacquier E, A. Kane and A.J. Marcus, 2003, *Geometric or Arithmetic Mean: A Reconsideration*, Financial Analysts Journal, 59, pp.46- 53.

> *leads to a preference for the arithmetic mean over the geometric mean. If historical average returns are used, they should be arithmetic rather than geometric averages.*[81]

155. NERA (2012)[82] has also previously explained the same point.

156. This point is again explained in more detail in Wheatley (2021), who advises as follows:

> *Again, there is no evidence, however, that the AER ever compounds an estimate of the allowed rate of return. Although revenue must be forecast for each of the several years of the typical regulatory period, at no stage, aside from in making minor adjustments to the regulated asset base and to the evolution of prices, is the allowed rate of return compounded over more than one year. Thus an allowed rate of return that is based solely on the arithmetic mean of a sample of annual returns to the market portfolio in excess of a risk-free rate will - so long as the other components of the allowed rate of return have been correctly computed and ignoring minor adjustments - produce an unbiased estimate of the revenue that the market requires the utility earn in any single year of a regulatory period.*[83]

157. In our view, geometric means should be disregarded when estimating a forward-looking MRP. There is no rationale for having regard to geometric means and consistent and clear explanations from a range of sources as to why arithmetic means must be used in the regulatory process.

4.4 The negative relationship between the risk-free rate and the MRP

Overview of the issue

158. The question of whether there might be a negative relationship between the MRP and risk-free rate has received considerable attention in the regulatory setting in recent years. Since 2018, Australian government bond yields have fallen to historical lows and there is evidence that the required return on equity has not fallen one-for-one with this decline in risk-free rates. By contrast, the ERA has consistently adopted a MRP of 6.0% in decisions since 2018, which implies that the required return on equity *does* vary one-for-one with changes in the risk-free rate. That is:

    a The ERA approach effectively assumes that there is no relationship between the risk-free rate and the MRP – the MRP is always constant; whereas

    b There is a substantial, and growing, body of evidence indicating that there is a negative relationship between the risk-free rate and the MRP – suggesting that the MRP has tended to increase to offset at least some of the decline in risk-free rates.

159. This issue has been a key focus of the AER's current 2022 RoRI review process. The AER has commissioned a report from CEPA to consider the evidence of a relationship between the risk-free rate and the MRP and this represents the most recent analysis of the issue.[84] In the following

[81] Lally, M., *The cost of equity and the market risk premium*, Victoria University of Wellington, 25 July 2012, pp. 31-32.

[82] NERA, February 2012, *The market risk premium: A report for CitiPower, Jemena, Powercor, SP AusNet and United Energy*, pp. 3-12.

[83] Wheatley, S., August 2021, *An examination of the RBA's new estimates of the MRP*, p. 25.

[84] CEPA, June 2021, *Relationship between RFR and MRP*.

sections of this report, we summarise the CEPA findings and recommendations, as well as other evidence on this issue.

The CEPA Report

160. The AER engaged CEPA to conduct analysis and provide advice and recommendations about the relationship between the risk-free rate and the MRP.

161. CEPA focuses on the three main estimation methods that are used by regulators to estimate the MRP:

    a **The fixed MRP approach**. Under this approach, the MRP is estimated as the mean of excess returns observed over a long historical period. This is the primary method used by the ERA. It assumes that there is no relationship between the risk-free rate and the MRP – that the MRP is essentially constant over time in all market conditions;

    b **The fixed total market return (fixed TMR) approach:** Under this approach, the expected return on the market is estimated as the average real return over a long historical period plus current expected inflation. This method assumes that there is a perfect negative relationship between the risk-free rate and the MRP – that the MRP changes to offset any variation in government bond yields; and

    c **The dividend growth model (DGM) approach:** Under this approach the expected return on the market is estimated as the discount rate that equates the present value of future dividends with the observed market index. This method makes no assumption about the relationship between the risk-free rate and the MRP – any relationship that might exist is determined by the data as part of the estimation process.

162. This section summarises the key conclusions and recommendations in the CEPA Report. [85]

Regulatory practice

163. CEPA performs a review of the approach of other comparable regulators and concludes that:

> *The international regulators that we examined do not rely on an estimate of the MRP that is wholly or even substantially based on the historic average of the realised MRP.* [86]

164. That is, other regulators do not adopt the assumption that the MRP is constant over time or independent of the risk-free rate.

Finance literature

165. CEPA's review of the relevant finance literature leads them to conclude that:

> *Recent finance academic literature overwhelmingly uses a time-varying MRP.* [87]
>
> *That is, the academic literature does not adopt the assumption that the MRP is constant over time, even as the risk-free rate changes.*

[85] CEPA, June 2021, *Relationship between RFR and MRP*.

[86] CEPA, June 2021, *Relationship between RFR and MRP*, p. 5.

[87] CEPA, June 2021, *Relationship between RFR and MRP*, p. 13.

166. Indeed, CEPA concludes that there is "no good evidence" to support the assumption of a constant MRP.[88] CEPA further concludes that the assumption of a fixed total market return has as much theoretical support as the assumption of a fixed MRP:

> *There also appears to be as strong a theoretical basis for the argument that the RfR and the MRP are perfectively negatively correlated (the "Wright" approach) as there is for the argument that the RfR and total equity market returns are perfectly positively correlated (the fixed MRP approach).* [89]

The role of assumption vs. empirical estimation

167. CEPA makes the point that a forward-looking DGM approach makes no assumption about the relationship between the risk-free rate and MRP. Rather, the relationship is determined by the data and is derived as part of the estimation process. [90]

168. By contrast, the approaches that use historical data do require an assumption about the relationship between the risk-free rate and MRP:

    a The "Ibbotson" or "fixed MRP" approach is based on the assumption that the MRP is constant over time, taking the same value in all financial market conditions; and

    b The "Wright" or "fixed TMR" approach is based on the assumption that the real required return on equity is constant over time.

169. CEPA explains that:

> ***The forward-looking approaches make no assumption*** *about the relationship between the RfR and the MRP, it is derived as part of the estimation.* ***For the historic approaches, an implicit assumption is required****: for the "Ibbotson" [fixed MRP] approach it is an implicit assumption that the MRP is stable, whereas for the "Wright" [fixed TMR] approach it is an implicit assumption that it varies inversely with the RfR. Regulators place weight on historic measures of the MRP in determining the cost of capital, and an assumption – implicit or explicit – is therefore required.* [91]

170. As noted above, CEPA further explains that, when considering the historical data, there is "no good evidence" to support the assumption of a constant MRP.[92] This leads CEPA to advise that an approach that has real regard to estimates from the fixed TMR approach (either alone, or in combination with the fixed MRP approach) might provide a better estimate of the MRP:

> *Our assessment is that (i)* ***there is acceptance that MRP is not stable*** *and (ii) it is possible that there is an inverse relationship between the forward looking MRP and the RfR, and (iii)* ***there is no good evidence that the MRP should be assumed to be independent of the RfR, the current implicit assumption of the AER's approach****, and (iv) there is no conclusive theoretical basis for an assumption of independence or dependence.*
>
> *In judging evidence on MRP using historic data, the AER can choose whether to use:*

[88] CEPA, June 2021, *Relationship between RFR and MRP*, pp. 6, 44.

[89] CEPA, June 2021, *Relationship between RFR and MRP*, p. 14.

[90] CEPA, June 2021, *Relationship between RFR and MRP*, p. 4.

[91] CEPA, June 2021, *Relationship between RFR and MRP*, p. 4, emphasis added.

[92] CEPA, June 2021, *Relationship between RFR and MRP*, pp. 6, 44.

An assumption that the MRP is fixed (current approach)

An assumption that the TMR is stable ("Wright approach")

An approach that has regard to both measures. This could be for example a weighted average of the two measures, that assumes that the MRP is related to the RfR, but the relationship is not one to one.

Our review of international regulators demonstrates that regulatory processes can accommodate any of these approaches. The data to implement these for Australia is available.

The evidence indicates that the second two alternatives cannot be ruled out, and may provide a better estimate of the forward looking MRP consistent with the AER's duty. We suggest that consideration of these options, and the evidence that would be necessary to decide between them is undertaken as part of the 2022 RORI process. [93]

171. We agree that the relationship between the risk-free rate and the MRP is a question that should be addressed by empirical estimation and not determined via assumption – especially if the proposed assumption is inconsistent with the empirical evidence.

Econometric analysis

172. As the approaches that are based on historical data (the fixed MRP and fixed TMR approaches) require an assumption about the relationship between the risk-free rate and the MRP, they cannot be used to derive or inform the nature of that relationship. That is, approaches that impose an assumption about the relationship obviously cannot be used to test whether the relationship exists or what form it might take.

173. CEPA notes that the forward-looking DGM approach requires no such assumption. Rather the nature of the relationship is determined as part of the estimation process.

174. In this regard, CEPA advises that:

As a result, in our judgement a decision on what assumption to make about the MRP should rely on empirical evidence. [94]

175. And further, that the empirical analysis must be based on forward-looking estimates of the MRP:

We consider that a decision on whether there is a relationship between the MRP and the RfR should be determined by empirical evidence. As we note above, the cost of equity and hence the MRP cannot be measured directly, but needs to be inferred. Consistent with commentary from leading finance academics, we take the approach that ***the historical data is a measure of the realised MRP, and does not measure forward looking expectations. To assess whether there is a relationship between the MRP and the RfR, we have to look at forward looking measures.*** [95]

176. CEPA has performed an econometric analysis using forward-looking estimates of the MRP and has concluded that:[96]

[93] CEPA, June 2021, *Relationship between RFR and MRP*, pp. 6-7, emphasis added.

[94] CEPA, June 2021, *Relationship between RFR and MRP*, p. 5.

[95] CEPA, June 2021, *Relationship between RFR and MRP*, p. 6, emphasis added.

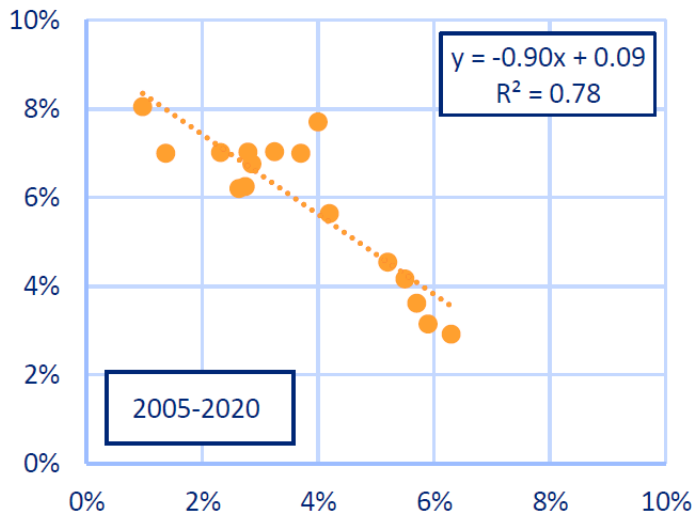
[96] CEPA, June 2021, *Relationship between RFR and MRP*, Section 5.

a There has been a strong and significant negative relationship between the risk-free rate and the MRP since central banks began utilising monetary policy to target inflation outcomes in the 1990s; and

b There is weak evidence of a negative relationship in earlier periods.

177. For example, CEPA shows that there is a strong negative relationship between ex-ante forward-looking DGM estimates of the MRP and 10-year government bond yields since 2005, as summarised in **Figure 5** below.

Figure 5: Relationship between risk-free rate and MRP: CEPA DGM estimates for Australian market

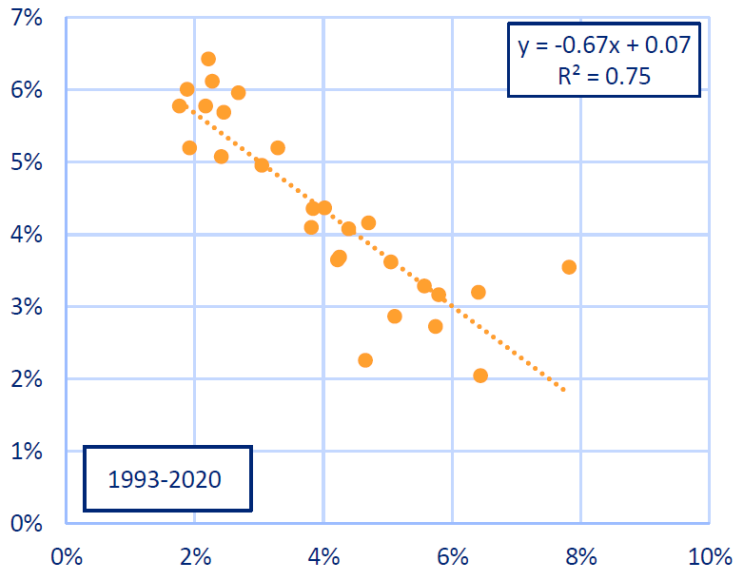


Source: CEPA, June 2021, Figure 5.6, p. 41. Note: Whilst CEPA does not make this clear, we believe that CEPA has presented risk-free rate estimates on the x-axis and MRP estimates on the y-axis.

178. CEPA further notes that a similar relationship has been demonstrated for the US market by Damodaran (2021),[97] as summarised in **Figure 6** below.

[97] Damodaran, 2021, *Equity risk premiums (ERP): Determinants, estimation, and implications – The 2021 edition*.

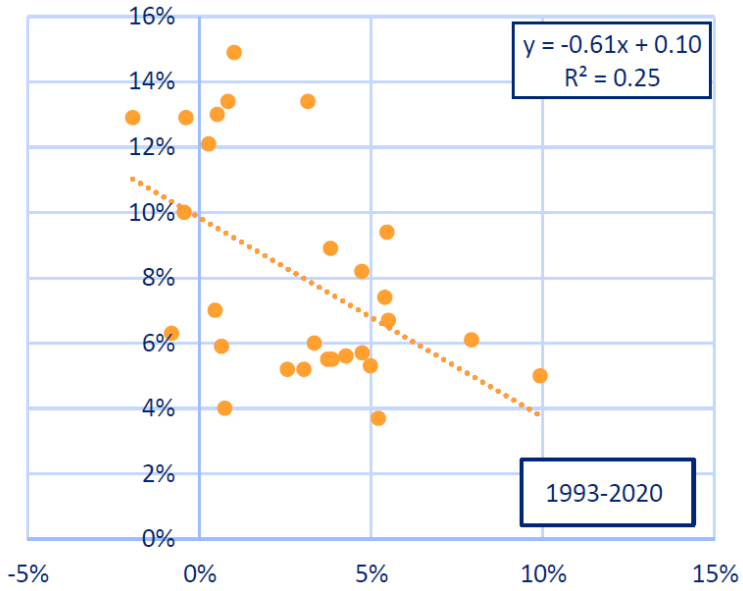
Figure 6: Relationship between risk-free rate and MRP: Damodaran DGM estimates for US market



Source: CEPA, June 2021, Figure 5.9, p. 43. Note: Whilst CEPA does not make this clear, we believe that CEPA has presented risk-free rate estimates on the x-axis and MRP estimates on the y-axis.

179. CEPA also demonstrates that a similar relationship exists between risk-free rates and actual excess returns observed over the subsequent 10 years, as summarised in **Figure 7** below.

Figure 7: Relationship between risk-free rate and MRP: CEPA estimates for Australian market using observed excess returns



Source: CEPA, June 2021, Figure 5.8, p. 42. Note: Whilst CEPA does not make this clear, we believe that CEPA has presented risk-free rate estimates on the x-axis and excess returns on the y-axis.

180. CEPA concludes that:

> *Over the entire period of our estimation of the MRP, from 1936, there is a weak, negative relationship between the implied MRP and the RfR.*
>
> *In the period since 1993, we consider there is a strong and convincing negative relationship between the implied MRP and the RfR.*
>
> *The relationship that we find for Australia is consistent with the data from the US published by Damodaran.* [98]

181. CEPA observes that the strong negative relationship between the risk-free rate and MRP that has been documented since the 1990s coincides with the changes in central bank monetary policy actions that occurred at that time:

> *The relationship appears to be stronger in more recent years, from the 1990s and possibly earlier. We have not undertaken econometric testing to detect a statistically significant structural break, but it does appear that the relationship is weaker in the earlier part of the dataset. It is possible that the action of central banks from the 1990s to set monetary policy settings to drive out inflation had a material impact on asset returns and investor expectations. Prior to this period, monetary policy was less disciplined, and less predictable. The move to a more stable relationship between these variables from the 1990s is consistent with this hypothesis.*[99]

Key conclusions from the CEPA report

182. The key conclusions and recommendations from the CEPA report are that:

a. The historical excess returns approach, which is the primary approach adopted by the ERA *assumes* that there is no relationship between the risk-free rate and the MRP. [100]

b. There is no good evidence to support that assumption. [101]

c. There is as strong a theoretical basis for the assumption of a fixed TMR (i.e., a perfect negative relationship) as there is for a fixed MRP (i.e., no relationship at all). [102]

d. CEPA recommends that, to the extent that historical data is to be relied upon when setting the allowed MRP, the fixed TMR assumption or a hybrid approach (having regard to the fixed TMR and fixed MRP assumptions) should be considered.[103]

e. The relationship between the risk-free rate and the MRP is a question that can only be addressed by empirical estimation and not determined via assumption.

f. The empirical analysis indicates that there has been a strong and significant negative relationship between the risk-free rate and the MRP since central banks began utilising monetary policy to target inflation outcomes in the 1990s.

[98] CEPA, June 2021, *Relationship between RFR and MRP*, p. 6, emphasis added.

[99] CEPA, June 2021, *Relationship between RFR and MRP*, p. 43.

[100] CEPA, June 2021, *Relationship between RFR and MRP*, p. 4.

[101] CEPA, June 2021, *Relationship between RFR and MRP*, pp. 6-7.

[102] CEPA, June 2021, *Relationship between RFR and MRP*, p. 6.

[103] CEPA, June 2021, *Relationship between RFR and MRP*, pp. 6-7, emphasis added.

ENA submissions

183. As part of the AER's 2022 RoRI process, Energy Networks Australia (ENA) has provided two submissions that relate to the relationship between the risk-free rate and the MRP. The ENA's summary of those submissions is set out below.[104]

ENA *Best Practice Framework* submission, October 2020

184. The ENA *Best Practice Framework* submission of October 2020[105] contains a number of observations on the relationship between the risk-free rate and the MRP. That submission noted that:

> *During the recent stakeholder forum, the AER was provided with evidence that real-world investors do not reduce required returns in line with changes in government bond yields. Rather, the return on equity that real-world investors require is relatively more stable than government bond yields. ENA suggests that this evidence is particularly relevant to the design of an approach to setting the allowed return on equity that is robust to changes in government bond yields.*
>
> *The relevant evidence presented at the Stakeholder Forum included:*
>
> - *Evidence from the Investor Reference Group (IRG) presentation that Australian firms have not reduced their required return on equity in line with recent falls in government bond yields. Evidence was presented from the RBA, TabCorp, EnergyAustralia, Stockland, Challenger, KPMG and Leadenhall; and*
> - *Evidence from the Morgan Stanley presentation that the approach that some practitioners adopt is to set the risk-free rate as a blend of the prevailing spot rate and the long-run average government bond yield. This results in the estimate of the required return on equity being partially 'immunised' against changes in government bond yields.* [106]

185. The ENA *Best Practice Framework* submission (pp. 36-38) also noted that independent expert valuation reports tend to:

a Adopt a risk-free rate above the prevailing government bond yield to at least partially offset the effect of any fall in government bond yields; and

b Apply ad hoc upward adjustments to their CAPM-WACC estimates that also have the effect of at least partially offsetting the effect of any fall in government bond yields.

186. The ENA *Best Practice Framework* submission (p. 39) also noted that a negative relationship between the risk-free rate and MRP was consistent with commercial estimates. For example, Brattle (2020) has observed that:

> *Bloomberg's analyses of the forward-looking MRP shows that the MRP increases as the risk-free rate declines, so that the resulting market return moves less than the risk-free rate.* [107]

187. Brattle has also observed that a number of regulators specifically recognise a negative relationship between the risk-free rate and the MRP:

[104] This summary appears in ENA, September 2021, *ENA response to equity omnibus paper*, Section 3.

[105] ENA, October 2020, *Best practice framework for setting the allowed return on equity*.

[106] ENA, October 2020, *Best practice framework for setting the allowed return on equity*, p. 36.

[107] ENA, October 2020, *Best practice framework for setting the allowed return on equity*, p. 39.

> *The FERC has recognized that there is a statistically significant relationship between historical movements in interest rates and equity risk premiums (defined as the authorised return on equity for electric transmission utilities over and above utility bond rates). When interest rate levels are relatively high, equity risk premiums narrow, and when interest rates are relatively low, equity risk premiums widen.* [108]

ENA *Low Rates* submission, May 2021

188. The ENA *Low Rates* submission of May 2021[109] also contains a number of observations on the relationship between the risk-free rate and the MRP.

189. ENA noted (p. 35) that Brattle (June 2020) has advised that:

> *We do not think that the overall rate of return changes one-for-one with the change in risk-free rate.* [110]

and (p. 36) that:

> *the measured MRP commonly increases as the risk-free rate declines and vice versa*[111]

and (p. 36) that:

> *When interest rate levels are relatively high, equity risk premiums narrow, and when interest rates are relatively low, equity risk premiums widen.*[112]

190. ENA also noted that other regulators (pp. 36-37) and independent expert valuation practitioners (p. 37) have recognised that the total required return on equity has not fallen in line with the recent falls in government bond yields. For example, Lonergan Edwards has observed that:

> *Whilst, prima-facie, recent lower interest rates globally have lowered the total equity return required by investors, based on our experience, such investors have* ***not reduced their required rates of return by the full extent of the fall in risk free rates****.* [113]

191. The ENA Low Rates submission of May 2021 also considered (pp. 38-42) three papers that the AER had cited as potential evidence of a positive relationship between risk-free rates and the MRP. ENA proposed that the approach of increasing the MRP when government bond yields rise and decreasing the MRP when government bond yields fall has no reasonable basis because:

    a The suggestion that the market cost of equity capital is set by increasing the MRP when government bonds yields rise and decreasing the MRP when government bond yields fall is inconsistent with the preponderance of evidence. The evidence overwhelmingly suggests that the returns required by equity market investors are *more* stable than is implied by adding a constant MRP to the prevailing government bond yield. The forward-looking DGM estimates imply the same thing. Thus, the notion of a *positive* relationship between the MRP and risk-free rate contradicts the overwhelming empirical evidence.

[108] ENA, October 2020, *Best practice framework for setting the allowed return on equity*, p. 38.

[109] ENA, July 2021, *Rate of return and cashflows in a low interest rate environment*.

[110] Brattle Group, June 2020, *A review of international approaches to regulated rates of return*, paragraph 3.

[111] Brattle Group, June 2020, *A review of international approaches to regulated rates of return*, p. 60.

[112] Brattle Group, June 2020, *A review of international approaches to regulated rates of return*, p. 93, emphasis added.

[113] Lonergan Edwards, 2019, pp. 46-47, emphasis added.

b Regulators and market professionals do not adopt a positive relationship between the risk-free rate and the MRP. By contrast, there are many examples of regulators and market professionals who adopt a negative relationship.

c The approach of adopting a positive relationship would amplify the volatility in government bond yields leading to more volatility in the allowed return on equity and on customer prices.

d The academic reports to which the AER refers do not make a strong case for a positive relationship. In particular, one of those papers—Damodaran (2012)—has been superseded by a 2021 version of the same study[114] that in fact presents strong evidence of a *countercyclical* (rather than procyclical) MRP since the Global Financial Crisis in 2008, and which argues strongly *against* the application of a fixed MRP estimate.[115]

Conclusions about the relationship between the risk-free rate and the MRP

192. Our view is that there is very strong evidence to support the existence of a negative relationship between the risk-free rate and the MRP. We consider that the body of evidence that is summarised above cannot be reasonably dismissed. We do not think that the required return on equity has fallen one-for-one with the decline in government bond yields that has occurred since 2018. Rather, our view is that the evidence indicates that the MRP has increased to at least partially offset the decline in government bond yields.

Implications for the approach to estimating the MRP

193. The foregoing discussion has a number of implications for the ERA's approach to estimating the MRP, as follows:

a The ERA's approach relies principally on the mean of historical excess returns. This approach has produced a constant estimate of 6.0% in every determination since 2018, even as government bond yields have changed materially. CEPA has advised that:

i This approach is based on the *assumption* that there is no relationship between the risk-free rate and the MRP, which is inconsistent with the evidence; and that

ii There "is no good evidence" to support the use of that approach.

b The ERA places no weight on estimates from the TMR approach that is used by a number of other regulators. CEPA has advised that:

i This approach is based on the *assumption* that there is a perfect negative relationship between the risk-free rate and the MRP, and that the empirical evidence is more consistent with this assumption than with the alternative assumption of no relationship; and that

ii There is as strong a theoretical basis for the assumption of a fixed TMR as there is for a fixed MRP; and consequently

[114] Damodaran, 2021, *Equity risk premiums (ERP): Determinants, estimation, and implications – The 2021 edition*.

[115] More detail on the papers that have been proposed as suggesting the possibility of a positive relationship are set out in the ENA *Low Rates* submission: ENA, May 2021, *Rate of return and cashflows in a low interest rate environment*, Section 5.5.

iii CEPA recommends that, to the extent that historical data is to be relied upon when setting the allowed MRP, the fixed TMR assumption or a hybrid approach (having regard to the fixed TMR and fixed MRP assumptions) should be considered.

c The DGM approach receives relatively little weight in the ERA's approach. This is the only approach that does not impose an assumption about the relationship between the risk-free rate and the MRP – letting the data determine any relationship as part of the estimation process. That approach is currently producing relatively higher estimates of the MRP, offsetting some of the decline in government bond yields that has occurred since 2018.

4.5 The implications of recent RBA market interventions

The RBA's interventions are significant and historically unique

194. The RBA has implemented a package of measures to help stimulate the Australian economy in response to the Covid-19 pandemic. The key features of this package are:

a A reduction in the cash target rate to 0.1%;

b Intervention in the market for 3-year Australian government bonds in whatever volumes are required to drive the yield down to 0.1%; and

c A government bond purchasing program targeted at maturities of 5 to 10 years.

195. The bond purchasing program was summarised in a recent speech by Deputy Governor Guy Debelle as follows:

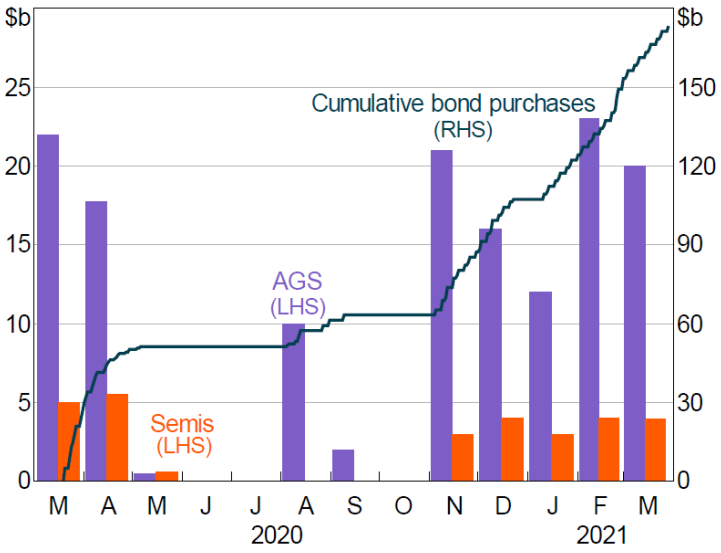
> *In November 2020, the Board announced a quantity-based bond purchase program that is complementary to the 3-year yield target…The bond purchase program announced in November 2020 was for the purchase of $100 billion in bonds of maturities of around 5 to 10 years over the following 6 months…In February 2021 the Board announced an additional $100 billion with the same composition and rate of purchase of $5 billion per week.*[116]

196. In a recent paper,[117] Dr Debelle reported that the RBA has already purchased more than $150 billion of government bonds, as illustrated in **Figure 8**: below.

[116] Debelle, G., 6 May 2021, *Monetary Policy During Covid*, Shann Memorial Lecture, Reserve Bank of Australia.

[117] Debelle, G., 2021, *Monetary policy in Australia during Covid*, ENA, in Monetary Policy and Central Banking in the Covid Era, Centre for Economic Policy Research, CEPR Press.

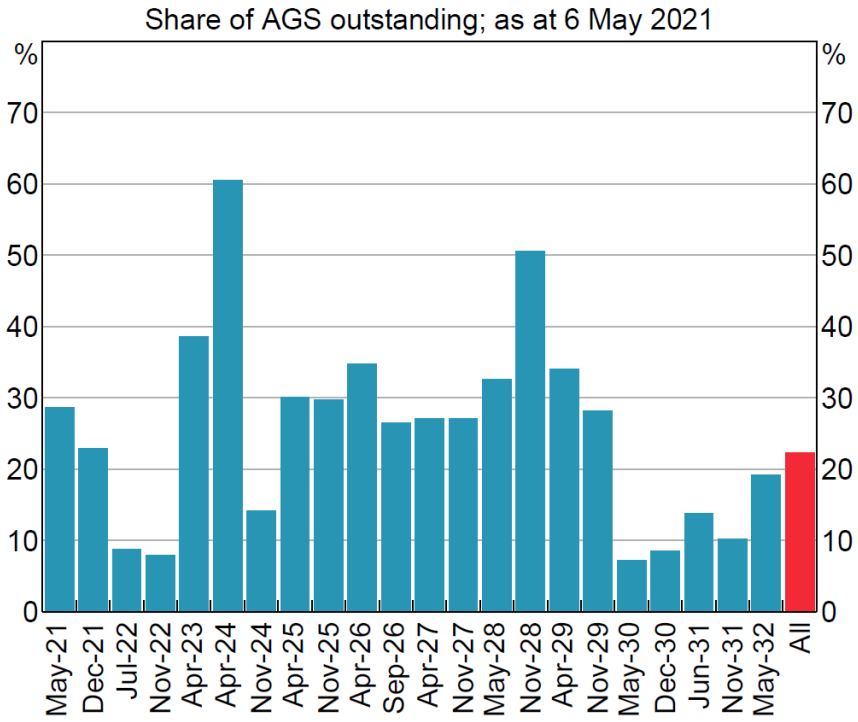
Figure 8: RBA bond purchases (face value, up to 29 March 2021)



Source: Reserve Bank of Australia.

197. The total volume of RBA holdings of Australian government bonds with various maturities is summarised in **Figure 9**: below, drawn from the RBA's May 2021 Statement of Monetary Policy.

Figure 9: RBA holdings of Australian government securities



Source: Reserve Bank of Australia, May 2021 Statement of Monetary Policy, Graph 3.8, p. 47.

198. The May 2021 Statement of Monetary Policy also reports that the RBA anticipates that its share of Australian government bonds will increase to 30% by September 2021:

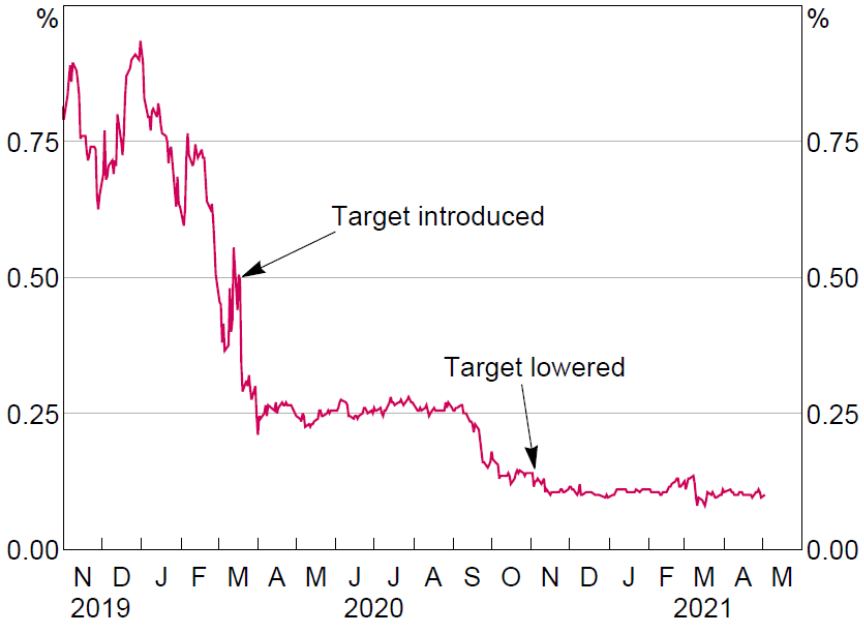
The Bank now holds 22 per cent of outstanding AGS and 10 per cent of outstanding semis (Graph 3.8). These shares are projected to increase to around 30 and 15 per cent respectively by early September following completion of the second $100 billion of bond purchases announced at the February Board meeting. Purchases have been at a pace of around $5 billion per week, except for one instance in early March when an additional $2 billion of bonds were purchased to provide further support during the period when market conditions were strained.[118]

199. These interventions are significant by any measure and are historically unique – the RBA has never before intervened in this way in Australian financial markets.

The RBA's interventions have had a material impact on rates, including the 10-year yield

200. The RBA's targeting of the yield on 3-year government bonds has been highly successful. The RBA was able to drive the yield down to the target of 25 basis points when that program was first implemented in March 2020, and then down to 10 basis points when the target was lowered in November 2020, as illustrated in **Figure 10**: below.

Figure 10: 3-year Australian government bond yield



Source: RBA; Debelle, G., 6 May 2021, Monetary Policy During Covid, Shann Memorial Lecture, Reserve Bank of Australia, Graph 5, p. 9.

201. The RBA also reports that its interventions in longer-term government bonds have depressed the yield on 10-year government bonds by approximately 30 basis points. For example, Dr Debelle reports that:

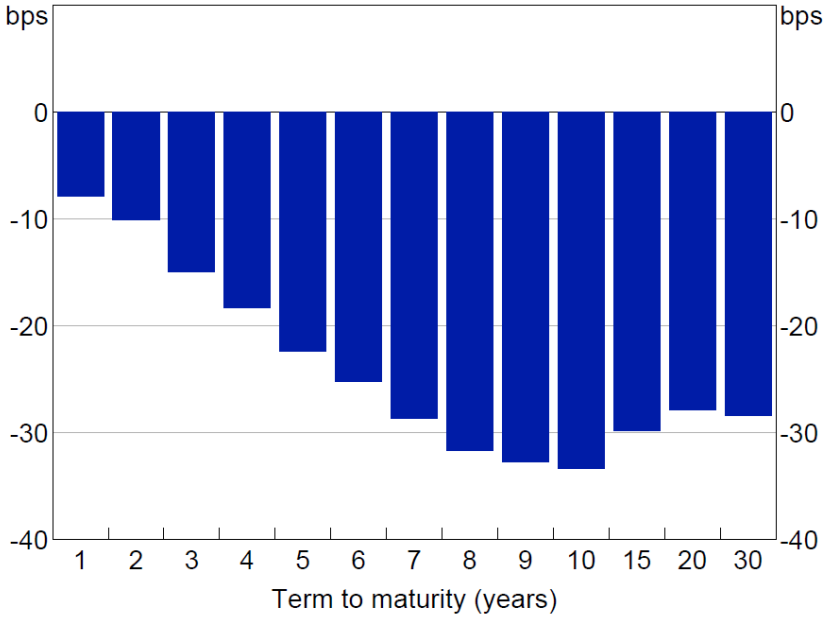
Our assessment is that the bond purchase program has continued to keep longer-term yields in Australia about 30 basis points lower than they otherwise would have been. [119]

[118] RBA, May 2021, *Statement of Monetary Policy*, p. 46.

[119] Debelle, G., 6 May 2021, *Monetary Policy During Covid*, Shann Memorial Lecture, Reserve Bank of Australia, p. 14.

202. This 30 basis point effect is discussed in more detail in a recent *RBA Bulletin* paper, which reports the results of an event study that is designed to capture the change in yields that occurred when markets incorporated the bond purchasing program into prices. That paper reports a reduction in the yield on 10-year government bonds of just over 30 basis points, as illustrated in **Figure 11**: below.

Figure 11: Change in Australian government bond yields



Source: Finlay, R., D. Titkov and M. Xiang, June 2021, An initial assessment of the Reserve Bank's bond purchase program, RBA Bulletin, Graph 1, p. 21.

203. In summary, the RBA has concluded that its interventions have had a significant effect – reducing the 10-year government bond yield by approximately 30 basis points below the level that would otherwise have been set by the market.

The RBA's interventions are expected to have an ongoing effect

204. Dr Debelle has recently noted that the RBA's interventions are expected to have an ongoing effect until the maturity of the bonds that have been purchased:

> *The general assessment of the research literature is that it is the stock of central bank bond purchases that matters rather than the flow. That is, it is the total size of the purchases that affects bond yields and financial conditions including the exchange rate, rather than how many bonds the central bank is buying each week. Clearly the two are closely related. But one important implication of this is that the stimulus remains in place even when the bond purchase program finishes. The stimulus only begins to unwind as the bonds that the central bank has bought mature.* [120]

205. The same view was expressed in the recent RBA Bulletin:

[120] Debelle, G., 6 May 2021, *Monetary Policy During Covid*, Shann Memorial Lecture, Reserve Bank of Australia, pp. 25-26.

> *[T]he evidence suggests that bond purchases serve to hold yields lower than they would have otherwise been over an extended period; this is also the evidence from studies of quantitative easing (QE) programs in other countries.*[121]

206. Since the RBA bond purchasing program targets government bonds with maturities up to 10 years, the effect of those interventions is expected to persist for the entirety of Horizon Power's first pricing period.

Implications of the RBA's interventions when the ERA sets regulatory allowances

207. In our view, the clear impact that the RBA's interventions have had in depressing the yields on Australian government bonds means that it is now more imperative than ever for the ERA to give meaningful consideration to the inverse relationship between the risk-free rate and the MRP.

208. Proceeding according to the assumption that the MRP is invariant to changes in the risk-free rate, as the ERA has done in recent years, is likely to result in the allowed return on equity being set below the true return on equity required by investors – particularly in the current environment where the RBA's actions have helped push Australian government bond yields to record lows.

4.6 Our recommendations

209. We make two recommendations in relation to the MRP:

a No weight should be applied to the geometric mean of historical excess returns.

The primary reason for this recommendation is the substantial body of evidence that concludes that it is inappropriate to place any reliance on the geometric mean of historical excess returns. Leading textbooks and case studies prepared by Professors at Harvard, Stanford, MIT, Wharton and London Business School not only report that they recommend the use of arithmetic means, but explain why it is wrong to use a geometric mean for the purpose of estimating forward-looking expected returns.

b Real weight should be applied to the DGM estimate and the total market return approaches that allow for a negative relationship between the risk-free rate and the MRP.

The primary reason for this recommendation is the substantial body of evidence that supports the existence of a negative relationship between the risk-free rate and the MRP. Our view is that the required return on equity has not fallen one-for-one with the decline in government bond yields that has occurred since 2018. Rather, our view is that the evidence indicates that the MRP has increased to at least partially offset the decline in government bond yields.

A key component of this body of evidence is the recent expert reports commissioned by the AER. Those reports advise that there is "no good evidence" to support the historical excess returns approach (which is the key driver of the ERA's allowance) and that such an approach is "not as effective as the approaches of other regulators." The AER's consultants have advised that consideration should be given to applying more weight to forward-looking DGM estimates and the total market return approach.

[121] Finlay, R., D. Titkov and M. Xiang, June 2021, *An initial assessment of the Reserve Bank's bond purchase program*, RBA Bulletin, p. 19.

Furthermore, the impact of recent RBA interventions has pushed Australian government bond yields to record lows. In these circumstances, continuing with the assumption that the MRP is invariant to changes in the risk-free rate may result in the allowed return on equity being set below the return actually required by equity investors. Hence, it is imperative now that the ERA recognise the likelihood of an inverse relationship between the risk-free rate and the MRP.

5 Equity beta

5.1 Overview and conclusions

210. The ERA currently adopts an equity beta estimate of 0.7 (using a benchmark level of gearing of 55%) for regulated energy networks. However, the ERA's Issues Paper indicates that, based on the latest data and the methodology that underpinned its existing estimate of 0.7, the current empirical evidence supports a lowering of the equity beta to 0.6 (using a benchmark level of gearing of 55%).

211. In this section, we explain that the ERA should:

    a Draw a clear distinction between *estimates* of beta (which are subject to significant estimation error, due to short-term statistical noise) and the *true level of systematic risk* (which cannot be observed).

    b Recognise that its task is to make a determination about the true level of systematic risk. The empirical estimates of beta are only one input to that decision.

    c Be very wary of concluding that the true level of systematic risk has fallen materially (as represented by a reduction in the beta allowance from 0.7 to 0.6) based on very short-term movements in beta estimates. Such caution is particularly warranted because:

        i The recent sharp reduction in beta estimates was driven by a sudden drop in the ASX, over February and March 2020 in response to uncertainty created by the start of the Covid-19 pandemic. The ASX recovered quickly from that singular event, but the ERA's 5-year beta estimates will continue to be depressed by the that event until early 2025, when the data relating to the Covid-19 crash eventually rolls out of the 5-year historical window the ERA uses to estimate betas. It is very unlikely that the true level of systematic risk of regulated energy networks fell in 2020 and remained persistently low. A far more likely explanation is that the ERA's beta estimates have been distorted downwards due to a temporary, outlier event that is yet to work its way out of the historical data the ERA uses to estimate beta;

        ii The sample of domestic comparators the ERA relies on to estimate beta have dwindled to just three firms. The use of such small comparator samples means that the ERA's beta estimates will be subject to significant statistical noise and estimation error, due to random variation in the data that affects the returns of individual comparators; and

        iii Recent analysis presented by the AER demonstrates that comparable regulators to the ERA overseas have recently adopted beta estimates that are materially higher than the equity beta estimate of 0.6 proposed by the ERA.

212. The ever-shrinking sample of domestic comparators relied on by the ERA—which could be reduced to just one firm if the proposed takeovers of AusNet Services and Spark Infrastructure proceed—means that it is becoming untenable for the ERA to continue to rely exclusively on domestic energy network comparators in order to estimate beta. When faced with very small samples of domestic comparators to the regulated rail networks in Western Australia, the ERA has elected to give some weight empirical beta estimates for overseas comparators. We recommend the ERA adopt the same approach when determining a beta allowance for regulated energy networks.

213. The ERA has recognised that certain features of Horizon Power's coastal network may mean that it faces more risk than other electricity distribution networks. In particular, the ERA has acknowledged that Horizon Power's coastal network has a very concentrated base of large customers with significant exposure to commodity market risk. When determining WACC estimates for regulated rail networks, the ERA has considered it appropriate to determine a higher beta allowance for the Pilbara railways (asset beta of 1.0; equity beta of 1.3 with gearing of 20%) than Arc Infrastructure (asset beta of 0.7; equity beta of 0.9 with gearing of 25%), because the Pilbara railways' customers in the mining and resources industry are significantly exposed to commodity market risk. The ERA should consider whether, by similar reasoning, Horizon Power's coastal network should be provided a higher beta allowance than other electricity distribution networks, who do not face similar risk exposures.

5.2 The ERA's current approach

214. The ERA's 2018 Rate of Return Guideline adopted an equity beta estimate of 0.7 using a benchmark level of gearing of 55%, and has used this estimate in energy network revenue determinations since 2018.

215. The approach the ERA used in the 2018 Rate of Return Guideline to estimate the equity beta involved considering empirical beta estimates for just four domestic comparators (APA Group, AusNet Services, DUET Group and Spark Infrastructure). The ERA gave no weight to estimates for overseas comparators.

216. The Issues Paper suggests that updated empirical analysis using current data and the methodology adopted by the ERA in the 2018 Rate of Return Guideline would support an equity beta estimate of 0.6 (presumably assuming benchmark gearing of 55%, as proposed by the ERA in the Issues Paper). The ERA does not present in the Issues Paper the details of its updated empirical estimates.

5.3 Beta estimates vs. true systematic risk

217. When determining regulatory allowances for beta, it is important for the ERA to distinguish clearly between *estimates* of beta and the *true* underlying systematic risk of the firms that it regulates.

218. The true systematic risk of regulated businesses cannot be observed directly; it can only be estimated indirectly, including via the statistical techniques that the ERA has relied on in previous determinations and Guidelines.

219. As with all statistical estimates, the estimate can diverge from the true figure due to statistical estimation error. Statistical estimation error does not refer to mistakes made in the estimation process, but to the fact that random 'noise' or variability in the data contaminates the estimate.

220. The ENA illustrated this point in a recent submission to the AER, by analysing empirically the impact of the recent takeover announcement for Spark Infrastructure on beta estimates for the firm.[122] The ENA observed that the announcement resulted in Spark Infrastructure's stock price increasing by approximately 17%. The ENA showed that the 5-year Ordinary Least Squares (OLS) beta estimate for Spark Infrastructure (derived using weekly returns data) would have been:

[122] ENA, Estimating the cost of equity, Response to AER's Pathway to 2022 Rate of Return Instrument: Draft Equity Omnibus Working Paper, 3 September 2021, pp. 73.

a 0.52 if the takeover announcement happened to occur in a week in which the Australian stock market was up by 5%; and

b 0.26 if the takeover announcement happened to occur in a week in which the Australian stock market was down by 10%.

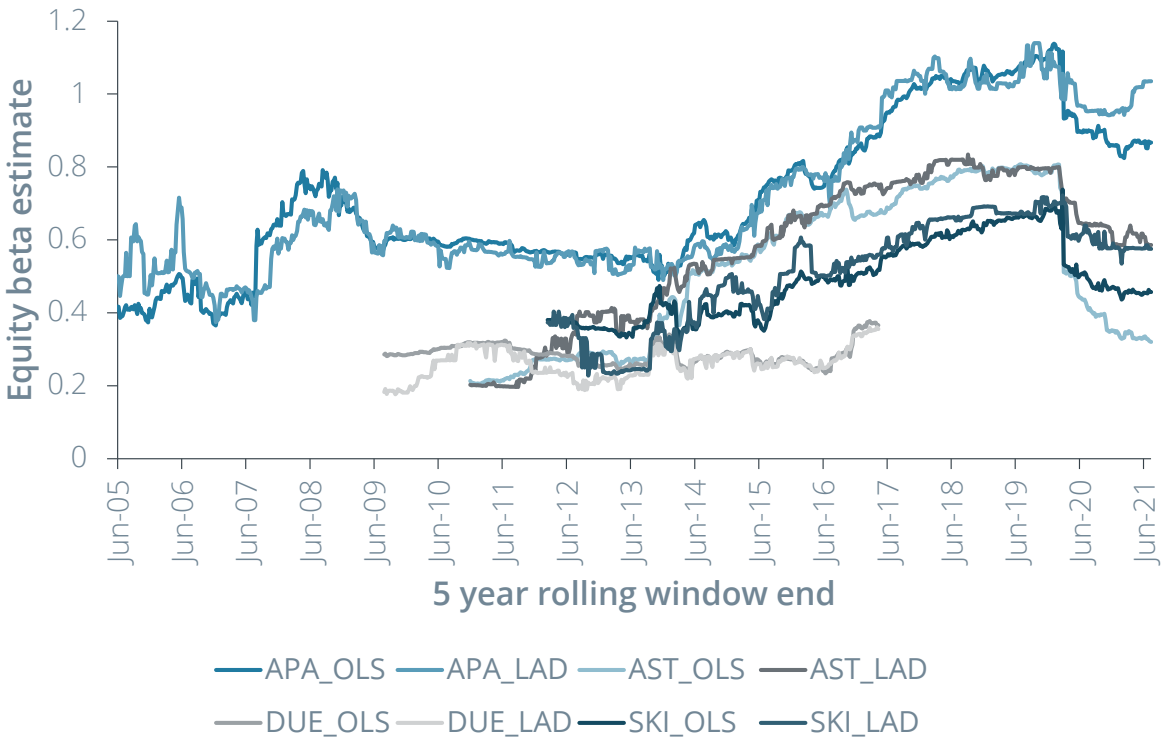
221. That is, the beta *estimate* can double or halve depending on whether the takeover announcement happens to be made in one week or the other. The timing of the takeover announcement, of course, has no relevance at all to the *true* systematic risk of Spark Infrastructure, but it does have an impact on the beta *estimate*.

222. As the ENA noted in its submission, even if the true systematic risk is perfectly constant over time, beta estimates can vary due to statistical noise, such as in the above example. Unfortunately, the ERA cannot observe the true systematic risk of a firm; the ERA can only observe *estimates* of systematic risk.

223. These problems become more severe as the sample of firms that are considered becomes smaller and smaller—an issue we discuss further in section 5.4 below.

224. **Figure 12** plots 5-year rolling OLS and Least Absolute Deviations (LAD) beta estimates (using weekly returns data) for each of the four domestic comparators that the ERA considered in its 2018 Rate of Return Guideline. All beta estimates in the Figure below are re-levered using the ERA's proposed gearing estimate of 55%.

Figure 12: 5-year rolling beta estimates for the ERA's four domestic comparators



Source: Frontier Economics analysis of Bloomberg data. 5-year beta estimates using weekly data. Re-levered to 55%. Note: DUET Group was de-listed in May 2017. Hence the estimates presented for DUET Group above were derived using a shorter returns series than was used to derive estimates for the other three comparators.

225. The Figure shows that the beta estimates for the four comparators have been extremely volatile since June 2005. The extent of the variability of the estimates can be seen more clearly in **Table 2**, which shows that:

    a In all cases, the difference between the minimum and maximum 5-year beta estimate between June 2005 and July 2021 exceeded 160%; and

    b In one instance (AusNet Services), the difference between the minimum and maximum 5-year beta estimate over the period exceeded 400%.

Table 2: Minimum and maximum 5-year beta estimates between June 2005 and July 2021 for the ERA's domestic comparators

	APA Group		AusNet Services		DUET Group		Spark Infra.	
	OLS	LAD	OLS	LAD	OLS	LAD	OLS	LAD
Minimum	0.36	0.37	0.21	0.20	0.23	0.18	0.33	0.23
Maximum	1.14	1.14	0.81	0.83	0.38	0.36	0.74	0.72
% difference	312%	305%	393%	425%	162%	204%	222%	317%

Source: Frontier Economics analysis of Bloomberg data. Estimates using weekly data. Re-levered to 55%. Note: DUET Group was de-listed in May 2017. Hence the estimates presented for DUET Group above were derived using a shorter returns series than was used to derive estimates for the other three comparators.

226. The true systematic risk of these firms is likely to be much more stable than implied by the estimates presented in **Figure 12**, since the core activities of these companies remains largely unchanged over time, they provide essential services that typically have a low elasticity of demand, and the companies themselves generate fairly stable returns over time.

227. Given the tendency for beta estimates to vary materially over time due to randomness, and given the likelihood that the true systematic risk of regulated energy networks is fairly stable, it is important to consider whether any observed changes in beta estimates are likely to reflect changes in the true systematic risk, or simply statistical noise. If there is reason to believe that the true systematic risk of a particular firm is likely to be quite stable over time, and if we observe substantial variation in the beta estimates over time, we would conclude that those beta estimates are likely to have been affected by the sort of random estimation error described above.

228. That is, the ERA should in our view be very cautious when concluding, based on less than three years of new data since it last examined this issue, that the equity beta of the energy networks it regulates has fallen from 0.7 to 0.6. It is entirely possible that the empirical evidence on which the ERA has based this tentative conclusion merely reflects random statistical variation rather than a genuine change in true systematic risk.

229. IPART has made exactly this observation when it recently reviewed its beta estimation methodology. IPART noted that:

> *Our draft report included a threshold test to be applied before changing a beta estimate that had been used in a prior price review for a particular industry. Noting that beta estimates are imprecise and volatile, and that small changes in beta can lead to large changes in prices, we*

> *are aware of the possibility that new analysis could result in departures from the status quo beta that are driven by noisy data rather than genuine market trends.*[123]

230. IPART went on to adopt "status quo" rule to guard against the possibility of changing the beta allowance in response to short-term variations in beta estimates driven by statistical noise. IPART determined that it would only depart from its "status quo" beta allowance if there was a sustained and material change in the beta estimates. Specifically, IPART concluded that it would:

> *Adopt the decision rule that before considering any revision to an established beta value for a price review:*
>
> - *Prior beta estimate is more than one standard deviation from the mean of the current sample, and*
> - *Persistent evidence over long period (ie, a regulatory period of four years or longer) of changed beta.*[124]

231. In our view, such a decision rule is sensible, given the tendency for changes in beta estimates over time to be highly volatile and driven by statistical noise.

232. **Figure 12** shows that the equity beta estimates of the ERA's three domestic comparators that currently remain listed (APA Group, AusNet Services and Spark Infrastructure):

    a Increased significantly between the ERA's 2013 and 2018 Rate of Return Guidelines;

    b Continued to increase through to the Covid-19 crash in early 2020; and

    c Declined substantially in February 2020 when the ASX fell sharply at the peak of uncertainty about the Covid-19 pandemic.

233. It is important to recognise that the beta estimates presented above (like the ERA's estimates) use a 5-year estimation window. This means that the effect of the sharp and short-lived fall in the ASX that resulted in the precipitous reduction in beta estimates in February 2020 will continue to depress 5-year beta estimates until early 2025.

234. This raises an important question about whether the sharp reduction in beta estimates associated with the Covid-19 crash reflects a sharp reduction in the true systematic risk of these firms, and an associated reduction in the true cost of equity capital, or whether the changes are a statistical artefact related to the Covid-19 crash.

235. **Table 3** presents the 5-year OLS beta estimates for the three live ERA comparators to July 2021, including and excluding returns data for February and March 2020. The Table shows that removing from the estimation window the returns data for those two months, during which the ASX dropped sharply in response to uncertainty over the Covid-19 pandemic, results in materially higher estimates for the three firms individually, and on average.

[123] IPART, August 2020, *Estimating Equity Beta for the Weighted Average Cost of Capital*, Final Report, p. 6.

[124] IPART, August 2020, *Estimating Equity Beta for the Weighted Average Cost of Capital*, Final Report, p. 2.

Table 3: 5-year OLS beta estimates to July 2021

Comparator	Incl. February & March 2020	Excl. February & March 2020
APA Group	0.78	0.92
AusNet Services	0.28	0.46
Spark Infrastructure	0.41	0.53
Mean	**0.49**	**0.64**

Source: Frontier Economics analysis of Bloomberg data. Estimates using weekly data. Re-levered to 55%.

236. We do not suggest that unusual or extreme events should be identified and removed when conducting beta estimation. Rather, we make the point that beta estimates based on a very limited dataset can be highly sensitive to a very small number of highly influential observations, and that this sensitivity should be taken into account when exercising judgment about the appropriate beta allowance for the purposes of determining the level of maximum allowable revenues. This is essentially the same issue as seen in the Spark Infrastructure takeover example above. In this instance, rather than the impact being due to a temporary factor in the price movement of a stock, it is due to a temporary shock to the market as a whole when Covid-19 first impacted the ASX; a shock from which the market recovered rapidly. For example, it seems unlikely that the true systematic risk of AusNet Services really did nearly halve during February last year.

5.4 The ERA's domestic comparator set is shrinking rapidly

237. In the 2018 Rate of Return Guideline, the ERA relied on four domestic comparators to determine its overall beta estimate. Of those four companies:

    a DUET Group was delisted in May 2017, and so has now remained 'dead' for nearly four-and-a-half years, contributing no new information over that entire period that could inform the ERA's beta estimation task; and

    b AusNet Services and Spark Infrastructure are currently the subjects of takeover offers. The Board of Spark Infrastructure has already accepted a takeover bid by a consortium of institutional investors.

238. This means that very soon, the ERA might have only one remaining listed domestic comparator with which to undertake beta estimation. In our view, the ERA's existing sample of just three comparators is too small to produce reliable beta estimates. A sample of one would all but guarantee unreliable estimates.

239. This is because the effect of random variation in stock returns that produce the sorts of estimation errors discussed in the previous section would be amplified as the sample of comparators shrinks. By contrast, the effect of random variations on the beta estimates of individual stocks would be dampened and diluted as the sample size expands.

240. In our view, this has two important implications for the ERA:

    a Firstly, the very small sample of comparators the ERA currently has its disposal means that the ERA should be extremely cautious about drawing strong conclusions about short-term movements in beta estimates. The dwindling number of domestic energy network

comparators is likely to introduce significant statistical 'noise' and estimation error to the ERA's task; and

b Secondly, the ERA should now think very seriously about giving some weight to estimates of comparator firms overseas, of which there are a great many. For instance, when the New Zealand Commerce Commission last reviewed its rate of return methodology in 2016, it identified (and relied on) 70 non-Australian comparator firms for the purposes of estimating a beta for the energy networks it regulates.

241. In relation to the second of these points, we agree with the ERA that there are benefits (in terms of comparability) associated with using domestic firms to perform the beta estimation task. However, the ERA should recognise that, when choosing an appropriate comparator sample, there is a trade-off between the comparability of the firms included in the sample and sample size. By relying on an ever-shrinking comparator set, the ERA may be able to preserve comparability between the firms it regulates and the firms it uses to estimate beta. However, this comes at the cost of reduced statistical reliability and an increase in the scope for material estimation error.

242. Ideally, the ERA would have a large sample of domestic energy network comparators with which to perform its beta estimation task. However, the reality is that the ERA's sample of domestic comparators has been dwindling, and may shrink even further in the coming months or years.

243. The ERA explained in its 2018 Rate of Return Guideline the importance of using returns data that are not too out of date, and that contribute some useful information about systematic risk over the forthcoming regulatory periods. This is one reason why the ERA elected in its 2018 Rate of Return Guideline to rely on beta estimates derived using the most recent 5-year period:

> *For the length of the data period, there is a trade-off between relevance of the data and statistical robustness. Longer time periods can include behaviour in the data that is no longer relevant due to changing economic and market conditions. However, shorter time periods may produce estimates that are less statistically robust. The ERA considered that a period of five years balances these trade-offs.*[125]

244. A de-listed comparator contributes *no new information* to the beta estimation task, and becomes less and less relevant with the passage of time. Therefore, if the ERA maintains its long-held view that its beta allowance should be informed by comparators that contribute new information about the systematic risk of the businesses it regulates, then reliance on de-listed domestic comparators will become increasingly untenable.

245. Given the present circumstances of now having only three (and soon possibly only one) listed domestic comparator, the ERA should in our view adopt the pragmatic approach of giving some weight to beta estimates for relevant energy network comparator firms overseas. The ERA could also give some consideration to beta estimates for non-energy infrastructure firms in Australia.

5.5 The ERA has relied on overseas comparators when regulating other industries

246. We note that the ERA has given weight to empirical evidence on overseas comparators when determining beta allowances for other regulated industries. For example, in its Final Determination

[125] ERA, December 2018, *Rate of return guideline: Explanatory statement*, p. 217.

on the 2018 and 2019 WACC for rail freight and urban networks, and the Pilbara Railways, the ERA explained the following:

> *The ERA noted that for rail there was a lack of comparable Australian companies. As a consequence, and consistent with its 2015 rail WACC approach, the ERA relied on overseas railway network operators in order to form the benchmark samples to estimate equity beta for the Public Transport Authority, Arc Infrastructure and Pilbara Railways.*[126]

247. It is noteworthy that:

    a For the purposes of estimating the beta for Arc Infrastructure, the ERA had identified three Australian comparators (Aurizon Holdings, Toll Holdings Ltd and Asciano Ltd)—the same number of live domestic energy comparators the ERA currently has access to. Notwithstanding this, the ERA also had regard to empirical beta estimates for five US comparators, two Canadian comparators and one New Zealand comparator (which was a port rather than a rail network).[127]

    b For the purposes of estimating the beta for the Public Transport Authority, the ERA identified two Australian comparators (Atlas Arteria and Transurban Group). However, the ERA also had regard to empirical beta estimates for three European comparators.[128]

248. In our view, even the comparator sets used by the ERA to determine beta allowances for the rail networks it regulates are too small to obtain statistically reliable beta estimates.

249. However, the point we wish to highlight is that, when deriving beta estimates for regulated rail networks, the ERA took the pragmatic step of expanding its comparator sample to include overseas firms—even if overseas may have been judged to be less comparable and relevant to the regulated businesses in Western Australia—because the ERA determined that the number of domestic comparators available was too small to produce reliable beta estimates.

250. In our view, the ERA should adopt a similar approach when selecting suitable comparators for the task of estimating energy network betas.

5.6 Estimates adopted by other regulators overseas

251. The beta estimation task is common to many regulators around the world. Many other regulators have faced the same challenge as the ERA – a small set of domestic comparators that produce volatile and inconsistent estimates.

252. Other regulators consider different sets of evidence and exercise judgment in different ways, but the one thing in common is that they all adopt an equity beta substantially higher than the ERA's proposed estimate of 0.6.

[126] ERA, August 2019, *Final Determination, 2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks, and the Pilbara Railways*, p. 55.

[127] ERA, August 2019, *Final Determination, 2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks, and the Pilbara Railways*, Table 15, p. 58.

[128] ERA, August 2019, *Final Determination, 2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks, and the Pilbara Railways*, Table 14, p. 56.

253. The AER has recently summarised the equity beta allowances adopted by a number of regulators overseas, which we reproduce below in **Figure 13** below. Every regulator considered in the Figure below adopts an equity beta higher than the 0.6 figure proposed by the ERA.

Figure 13: AER's summary of beta allowances adopted by regulators overseas

Inter-national regulator	Original equity beta	Gearing	Adjusted equity beta
ACM	0.74	50%	0.79
FERC	0.84	60%	0.84
STB	1.11	16.92%	1.52
ARERA	0.71	44%	0.78
NZCC	0.60	42%	0.68
NZCC*	0.65	42%	0.74
Ofgem	0.76	55%	0.78
Ofgem*	0.71	55%	0.74
Ofwat	0.71	54.2%	0.74
Ofwat (CMA)	0.76	54.2%	0.79

Notes: All Ofgem values refer to the December 2020 values for the electricity transmission industry. FERC does not explicitly state a gearing value hence, we have assumed a gearing ratio of 60%. Ofwat de-levers equity beta to asset beta using an actual gearing estimate of 54.2% rather than a notional gearing value of 60%. Regulators marked with an asterisk indicate that an adjustment has been made in the Brattle report for easier comparison.

Source: AER, December 2020, International regulatory approaches to rate of return, Table 5, pp. 26-27.

254. However, the true differences are even more stark than **Figure 13** would suggest. The AER appears to have mis-estimated the re-levered beta estimates by erroneously replacing the standard measure of gearing of $\frac{D}{V}$ with $\frac{D/V}{1+D/V}$. The correct figures, re-levered to 60% in the correct way to be comparable with the AER's beta allowance, are presented in the fourth column of **Table 4** below. The lowest of those corrected equity betas is 0.8; all other estimates are higher and, in some cases, very materially higher.

Table 4: Corrected overseas beta allowances

Regulator	Original equity beta	Gearing	Correct re-levered equity beta Gearing = 60%	Correct re-levered equity beta Gearing = 55%
ACM	0.74	50%	0.93	0.83
FERC	0.84	60%	0.84	0.75
STB	1.11	17%	2.31	2.05
ARERA	0.71	44%	0.99	0.88
NZCC	0.6	42%	0.87	0.77
NZCC*	0.65	42%	0.94	0.84
Ofgem	0.76	55%	0.86	0.76
Ofgem*	0.71	55%	0.80	0.71
Ofwat	0.71	54%	0.81	0.72
Ofwat (CMA)	0.76	54%	0.87	0.77

Source: Frontier Economics analysis of estimates presented by the AER.

255. The final column of **Table 4** shows that if the overseas beta allowances identified by the AER are re-levered correctly using the ERA's gearing estimate of 55%, every one of those estimates is greater than 0.7; none are as low as the estimate of 0.6 proposed by the ERA.

256. The analysis above suggests that the judgement the ERA has applied in assessing the domestic evidence has led the ERA to propose an equity beta estimate that is markedly out of step with the other comparable regulators overseas.

257. In our view, this is important evidence in assessing the confidence that can reasonably be placed in the ERA's approach of relying exclusively on domestic comparators when setting the equity beta allowance.

5.7 The special risk characteristics of Horizon Power's coastal network

258. The ERA's Issues Paper identified a number of special characteristics of Horizon Power's coastal network that may mean the risk profile of that network differs from that of other regulated electricity networks in Australia. The ERA acknowledges that:[129]

[129] ERA, September 2021, *Determination of Pilbara networks rate of return, Issues paper*, p. 6.

a The customer base served by Horizon Power's coastal network "is small, relative to other electricity distributors in Australia";

b The Horizon Power's coastal network services major loads in the port area of Port Hedland, and that these major customers are "exposed to risks in commodity markets, particularly iron ore'";

c "Horizon Power's customer base in the Pilbara region is less diversified than the customer bases of other electricity network service providers." For example:

i The three large resource-based customers represent around 40% of the non-coincident peak demand on the Pilbara network;

ii High voltage customers represent 0.2% of the customer base and almost 9% of the non-coincident peak demand on the Pilbara network;

iii The majority of customers (99.8%) represent 52% of the non-coincident peak demand on the Pilbara network.

259. These features acknowledged by the ERA, may mean that the beta allowance applied to Horizon Power's coastal network should be greater than that applied by the ERA to other electricity distributors, because Horizon Power's coastal network is exposed to greater systematic risk than other electricity distribution networks.

260. There is ERA precedent for this in relation to rail networks. The ERA currently produces WACC estimates to two rail freight networks:

a Arc Infrastructure, which provides below rail freight infrastructure services in the south-west of Western Australia; and

b The Pilbara railways, which provide rail freight services exclusively to iron ore producers in the Pilbara region.

261. The ERA has consistently drawn a distinction between the risk profiles of these two rail networks on the grounds that the Pilbara railways are exposed heavily to a single industry (mining and resources), which itself is highly cyclical and exposed to economic fluctuations. For instance, the ERA has determined that:

> *The Pilbara Railways were likely to have a higher level of risk than an intermodal or general freight railway as the Pilbara Railways were single commodity railways in a remote location that exclusively served mining-related export demand.* [130]

262. In keeping with this reasoning, the ERA's 2018 and 2019 determination on rail WACCs, the ERA adopted:

a An asset beta estimate of 0.7 (equity beta estimate of 0.9 with gearing of 25%) for Arc Infrastructure; and

b An asset beta estimate of 1.0 (equity beta of 1.3 with gearing of 20%) for the Pilbara railways.

263. Whilst Horizon Power's coastal network does not exclusively serve mining and resources customers as the Pilbara railways does, the ERA itself has acknowledged that Horizon Power's

[130] ERA, August 2019, *Final Determination, 2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks, and the Pilbara Railways*, p. 61.

coastal network has a very concentrated base of large customers with significant exposure to commodity market risk. The ERA recognises that this sets Horizon Power's coastal network apart from other electricity distribution networks.

264. We note that the section 57(2) of the Pilbara Networks Access Code requires that, when determining a rate of return for Horizon Power, the ERA must:

> *not assume that the circumstances of each light regulation network are the same;*

265. In our view, the ERA should consider whether, by similar reasoning to that adopted by the ERA when determining beta estimates for regulated rail networks in Western Australia, Horizon Power's coastal network should be provided a higher beta allowance than other electricity distribution networks, who do not face similar risk exposures. If the ERA concludes that it should not adopt a similar approach in Horizon Power's case, the ERA should explain clearly the reasons for that conclusion.

5.8 Our recommendation

266. We make three key recommendations in relation to the equity beta:

a The ERA should be very cautious about concluding, based on recent changes in empirical beta estimates for a very small sample of domestic comparators, that the equity beta allowance should be adjusted down from 0.7 to 0.6.

The primary reasons for this are that:

i There is a sharp distinction between *true systematic risk* (which is unobservable) and empirical *estimates* of beta that can be highly volatile over the short-term due to random statistical noise, rather than true changes in systematic risk;

ii There is very compelling evidence that the recent reduction in beta estimates was driven by a sharp drop in the ASX in February and March of 2020, due to the onset of Covid-19. This fall in the ASX was quickly reversed, but the effect of that temporary shock will continue to affect the ERA's beta estimates until early 2025, since the ERA uses a 5-year historical returns window to estimate betas. In our view, it is implausible that the true systematic risk of regulated energy networks in Australia fell in response to a global pandemic that had only a temporary effect on the Australian stock market; and

iii The very small number of domestic comparators that the ERA relies on means that the ERA's beta estimates are particularly prone to statistical noise and estimation error; The AER has recently presented evidence that the beta allowances set by comparable regulators to the ERA overseas are materially higher than the equity beta of 0.6 proposed by the ERA.

b The ERA should now give material weight to beta estimates of overseas comparators, rather than continue to place exclusive reliance on domestic energy comparators.

The primary reason for this is that the dwindling number of domestic comparators relied on by the ERA to estimate betas makes it increasingly untenable for the ERA to continue to rely exclusively on domestic energy comparators. The existing sample of three comparators is, in our view, insufficient to produce reliable beta estimates. That number could conceivably fall to just one firm if the proposed takeovers of AusNet Services and Spark Infrastructure proceed. When faced with similar circumstances, when estimating

the betas of regulated rail networks in Western Australia, the ERA has elected to give material weight to the estimates of overseas comparator firms. The ERA should now adopt a similar approach when determining the beta allowance of regulated energy networks.

c The ERA should consider whether Horizon Power's coastal network should receive a higher beta allowance than other regulated energy networks.

The primary reason for this is because the ERA itself has acknowledged that Horizon Power's coastal network has a highly concentrated customer base of large customers exposed to significant commodity market risk. For similar reasons, the ERA has previously determined that it is appropriate to determine a higher equity beta for the Pilbara railways than other freight (more diversified) freight rail networks in Western Australia.

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