FINAL DECISION
Jemena distribution determination
2016 to 2020

Attachment 3 – Rate of return

May 2016

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Note

This attachment forms part of the AER's final decision on Jemena's distribution determination for 2016–20. It should be read with all other parts of the final decision.

The final decision includes the following documents:

Overview

Attachment 1 – Annual revenue requirement

Attachment 2 – Regulatory asset base

Attachment 3 – Rate of return

Attachment 4 – Value of imputation credits

Attachment 5 – Regulatory depreciation

Attachment 6 – Capital expenditure

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Contents

Shortened forms

Shortened form	Extended form
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
ARORO	allowed rate of return objective
BVAL	Bloomberg Valuation Service
capex	capital expenditure
CAPM	capital asset pricing model
CCP	Consumer Challenge Panel
CGS	Commonwealth Government Securities
CPI	consumer price index
DGM	dividend growth model
DRP	debt risk premium
distributor	distribution network service provider
ERP	equity risk premium
FFM	Fama-French three-factor model
The Guideline	The rate of return guidelines, published December 2013
JEN	Jemena Electricity Networks
MRP	market risk premium
MSE	mean squared error
NEL	national electricity law
NEO	national electricity objective
NER	national electricity rules
NGL	national gas law
NGO	national gas objective
NGR	national gas rules
NPV	net present value
NSP	network service provider
OLS	ordinary least squares
opex	operating expenditure
PTRM	post-tax revenue model
RAB	regulatory asset base

Shortened form	Extended form
RBA	Reserve Bank of Australia
RPP	revenue and pricing principles
the Tribunal	the Australian Competition Tribunal
WACC	weighted average cost of capital

3 Rate of return

The allowed rate of return provides a network service provider a return on capital that a benchmark efficient entity would require to finance (through debt and equity) investment in its network.[1] The return on capital building block is calculated as a product of the rate of return and the value of the regulatory asset base (RAB). The rate of return is discussed in this attachment.

3.1 Final decision

We are satisfied that the allowed rate of return of 6.37 per cent (nominal vanilla) we determined achieves the allowed rate of return objective (ARORO).[2] That is, we are satisfied that this allowed rate of return is commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to Jemena Electricity Networks (JEN) in providing standard control services.[3]

This allowed rate of return will apply to JEN for the 2016 regulatory year. A different rate of return will apply to JEN for the remaining regulatory years of the 2016–20 regulatory control period. This is because we will update the return on debt component of the rate of return each year to partially reflect prevailing debt market conditions in each year. We discuss this annual update further below.

We are not satisfied that JEN's proposed (indicative) 8.62 per cent rate of return for the 2016 regulatory year has been determined such that it achieves the ARORO.[4]

Our allowed rate of return is a weighted average of our return on equity and return on debt estimates (WACC) determined on a nominal vanilla basis that is consistent with our estimate of the value of imputation credits.[5] We are to determine the allowed rate of return such that it achieves the ARORO.[6] Also, in arriving at our decision we have taken into account the revenue and pricing principles (RPPs) and are also satisfied that our decision will or is likely to contribute to the achievement of the National Electricity Objective (NEO).[7] Our rate of return and JEN's proposed rate of return is set out in the following Table 3-1.

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1 The term network service provider relates to service providers that provide gas and electricity transmission and distribution services.

2 NER, cl. 6.5.2(b).

3 NER, cl. 6.5.2(c).

4 JEN, *2016 to 2020 electricity distribution price review regulatory proposal: Revocation and substitution submission*, 6 January 2016, p. 26.

5 NER, cl. 6.5.2(d)(1) and (2).

6 NER, cl. 6.5.2(b); NER, cl. 6A.6.2(b); NGR, r. 87(2).

7 NEL, s.16.

Table 3-1 Final decision on JEN's rate of return (% nominal)

	AER previous decision (2011–15)	JEN revised proposal (2016)	AER final decision (2016)	Allowed return over 2016–20 regulatory control period
Return on equity (nominal post–tax)	10.85	9.89	7.5	Constant (7.5%)
Return on debt (nominal pre–tax)	9.99	7.77	5.62	Updated annually
Gearing	60	60	60	Constant (60%)
Nominal vanilla WACC	10.33	8.62	6.37	Updated annually for return on debt
Forecast inflation	2.57	2.19	2.32	Constant (2.32%)

Source: AER analysis; JEN, *2016 to 2020 electricity distribution price review regulatory proposal: Revocation and substitution submission*, 6 January 2016; AER, *Jemena Electricity Networks (Victoria) Ltd distribution determination 2011–2015: Pursuant to Orders of the Australian Competition Tribunal in Application by United Energy Distribution Pty Limited (No 2) [2012] ACompT 8*, September 2012.

Our return on equity estimate is 7.5 per cent. This rate will apply to JEN in each regulatory year. Our return on debt estimate for the 2016 regulatory year is 5.62 per cent. This estimate will change each year as we partially update the return on debt to reflect prevailing interest rates over JEN's debt averaging period in each year. Our return on debt estimate for future regulatory years will be determined in accordance with the methodology and formulae we have specified in this decision. As a result of updating the return on debt each year, the overall rate of return and JEN's revenue will also be updated.

We agree with the following aspects of JEN's revised rate of return proposal:

- adopting a weighted average of the return on equity and return on debt (WACC) determined on a nominal vanilla basis (as required by the rules)
- adopting a 60 per cent gearing ratio
- adopting a 10 year term for the return on debt
- estimating the return on debt by reference to a third party data series.
- estimating the risk free rate used in the return on equity with nominal Commonwealth government securities (CGS) averaged over 20 business days as close as practical to the commencement of the regulatory control period.

Consistent with our preliminary decision, we agree there should be a transition from the on-the-day approach to the trailing averaging approach to estimating the return on debt. However, we disagree with the hybrid form of transition proposed in JEN's (initial) regulatory proposal.

In its revised proposal, JEN departed from its initial position to apply a transition to the trailing averaging approach at all. It now proposes to not apply a transition (that is, to immediately move to a trailing average approach). We disagree with JEN on this and a number of other components of the rate of return.

Our return on equity estimate for this final decision is 7.5 per cent. We derived this estimate by applying the same approach we applied to determine the allowed return on equity in our most recent final decisions.[8] The Australian Competition Tribunal (Tribunal) recently upheld this approach.[9] This approach entails applying the Guideline approach referred to as the foundation model approach.[10] We applied this same approach in the preliminary decision.[11] This is a six step process, where we have regard to a considerable amount of relevant information, including various equity models. At different stages of our approach we have used this material to inform the return on equity estimate.

Our return on equity point estimate and the parameter inputs are set out in the Table 3-2. JEN proposed departing from the approach in the Guideline. We are not satisfied that doing so would result in an outcome that better achieves the ARORO.[12] We do not agree with JEN that our method applied in the preliminary decision will result in a return on equity which is inconsistent with the ARORO.[13] Our return on equity preliminary decision and this final decision is largely consistent with the views in the Guideline.

Table 3-2 Final decision on JEN's return on equity (nominal)

	AER previous decision (2011–15)	JEN revised proposal (2016-20)	AER final decision (2016–20)
Nominal risk free rate (return on equity only)	5.65%	2.75%*	2.93%**
Equity risk premium	5.20%	7.19%	4.55%
MRP	6.50%	7.90%	6.50%
Equity beta	0.8	0.91	0.7
Nominal post–tax return on equity	10.85%	9.89%	7.5%

Source: AER analysis; JEN, *Revocation and substitution submission Attachment 6-1 Rate of return, gamma, forecast inflation, and debt and equity raising costs*, 6 January 2016; AER, *Final decision: Victorian electricity distribution network service providers: Distribution determination 2011–2015*, October 2010.

8 AER, *Final decision: SA Power Networks determination 2015 -16 to 2019–20, Attachment 3—Rate of return*, October 2015. Also see our most recent decisions on Ergon Energy and Energex.

9 For example, see Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, para 813.

10 AER, *Better regulation: Rate of Return Guideline,* December 2013.

11 AER, *Preliminary decision, JEN distribution determination 2016 to 2020, Attachment 3–Rate of return*, October 2015.

12 NER, cl. 6.2.8(c)

13 JEN, *2016 to 2020 electricity distribution price review regulatory proposal: Revocation and substitution submission*, 6 January 2016, pp. 31, 34.

* Calculated with a placeholder averaging period of 20 business days to 30 September 2015.

** Calculated with an averaging period of 20 business days up to 11 December 2015 agreed upon in advance of its commencement.

Our final decision on the return on debt approach is to:

- estimate the return on debt using an on-the-day approach (that is, based on prevailing market conditions near the commencement of the regulatory control period) in the first regulatory year (2016) of the 2016–20 regulatory control period, and
- gradually transition this approach into a trailing average approach (that is, a moving historical average) over 10 years.[14]

This gradual transition will occur through updating 10 per cent of the entire return on debt each year to reflect prevailing market conditions in that year (a full transition).[15] This approach is consistent with the approached we proposed in the Guideline and adopted in the preliminary decision. Our final decision is to estimate the return on debt in each regulatory year by reference to:

- a benchmark credit rating of BBB+
- a benchmark term of debt of 10 years
- independent third party data series—specifically, a simple average of the broad BBB rated debt data series published by the the Reserve Bank of Australia (RBA) and Bloomberg, adjusted to reflect a 10 year estimate and other adjustments[16]
- an averaging period for each regulatory year of between 10 business days and 12 months (nominated by the service provider), with that period being consistent with certain conditions that we proposed in the Guideline.[17]

It is worth noting that the Tribunal recently reviewed several aspects of our approach to estimating the allowed return on debt in recent decisions for ActewAGL, Jemena Gas Networks and Networks NSW. Specifically, the Tribunal was asked to review:

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[14] This final decision determines the return on debt methodology for the 2016–20 regulatory control period. This period covers the first five years of the 10 year transition period. This decision also sets out our intended return on debt methodology for the remaining five years. However, we do not have the power to determine in this decision the return on debt methodology for those years. Under the NER, the return on debt methodology must be determined in future decisions that relate to that period.

[15] By entire return on debt, we mean 100% of the base rate and debt risk premium (DRP) components of the allowed return on debt.

[16] For the RBA curve, our final decision is to interpolate the monthly data points to produce daily estimates, to extrapolate the curve to an effective term of 10 years, and to convert it to an effective annual rate. For the Bloomberg curve, our final decision is to extrapolate it to 10 years using the spread between the extrapolated RBA seven and 10 year curves (where Bloomberg has not published a 10 year estimate), and to convert it to an effective annual rate. While we do not propose estimating the return on debt by reference to the Reuters curve, we do not rule out including doing so in future determinations following a proper period of consultation.

[17] AER, *Rate of return guideline*, December 2013, pp. 21–2; AER, *Explanatory statement—Rate of return guideline*, December 2013, p. 126.

- Whether a benchmark efficient entity would have a credit rating of BBB rather than BBB+. It upheld our decision to define a benchmark credit rating as a BBB+ credit rating.[18]
- Whether we should estimate the allowed return on debt using the RBA data series alone or a simple average of the RBA and Bloomberg data series. It upheld our decision and found that, 'averaging of the two curves was an acceptable measure of the DRP'. [19]
- Whether we should transition all of the return on debt[20] from an on-the-day approach in the first regulatory year to a trailing average by updating 10 per cent of the debt portfolio over 10 years (a full transition). It remitted the determination back to us to make a constituent decision on introducing the trailing average approach in accordance with several reasons outlined in its decision.[21] We note the Tribunal's decision in section 3.4.2 and Appendix H.

In the Guideline, we proposed to use one or more third party data series to estimate the return on debt.[22] At that time, however, we had not formed a view on which data series to use. Our April 2014 issues paper outlined how we would make this choice and sought submissions from service providers.[23] In the preliminary decision, we formed a view on this issue and adopted a simple average of the RBA and Bloomberg data series. Since then, several service providers have proposed to adopt a Thomson Reuters 10 year yield curve in addition to or in place of the Bloomberg data series. We have considered these proposals but maintain our preliminary decision position for reasons discussed in section 3.4.2.

Our formula for automatically updating the return on debt annually is set out in Appendix J of this decision.

3.2 JEN's revised proposal

Return on equity

JEN proposed a return on equity estimate of 9.89 per cent.[24] This is based on a foundation model approach with parameter uplifts that incorporate information from a

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18 For example, see Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, para 993.

19 For example, see Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, para 983.

20 For clarity, that is 100% of the base rate and DRP components of the allowed return on debt.

21 For example, see Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, para 1,227. The Tribunal's reasons are set out in paras 870 to 940.

22 AER, *Explanatory statement—Rate of return guideline*, December 2013, pp. 23–4.

23 AER, *Issues Paper - Return on debt: Choice of third party data service provider*, April 2014.

24 JEN, *2016 to 2020 electricity distribution price review regulatory proposal: Revocation and substitution submission*, 6 January 2016, p. 28.

multiple model approach.[25] While presented differently, this is practically similar to JEN's initial proposed return on equity estimate, which was based on a multi-model approach.[26]

Return on debt

In its revised regulatory proposal, JEN proposed to depart from the position in its (initial) regulatory proposal on how to transition from the on-the-day approach to trailing average approach. JEN previously proposed to calculate its return on debt using a hybrid transition which combines a gradual transition of the base rate with a backwards looking trailing average debt risk premium (DRP).[27] However, it now proposes an immediate transition to a trailing average, using both a backwards looking base rate and DRP. As such, JEN proposed a return on debt estimate of 7.77 per cent for regulatory year 2016.[28]

In implementing the return on debt, JEN proposed:

- a 10 year term and BBB to BBB+ credit rating be used which is different to the BBB+ rating we proposed in the Guideline, [29] and
- using several defined processes for selecting the third-party data source, averaging period and extrapolation method to use in each year of the regulatory control period.[30]

3.3 Assessment approach

The National Electricity Law/National Gas Law (NEL/NGL) and rules (NER/NGR) form our framework for determining the rate of return. The key components of this framework include:

- national electricity/gas objective (NEO/NGO) and the RPPs in the NEL/NGL.
- the overall rate of return—consisting of the allowed return on equity and debt
- the ARORO and its elements
- return on debt factors
- considering interrelationships within the rate of return

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25 As per: Frontier Economics, *The required return on equity under a foundation model approach: Report prepared for JEN, ActewAGL Distribution, AusNet Services, AGN, CitiPower, Powercor and JEN*, January 2016.

26 In JEN's initial regulatory proposal, SFG's estimates of the SLCAPM, Black CAPM, Fama–French three factor model and DGM were weighted equally. JEN, *Regulatory proposal*, 30 April 2015, p. 99.

27 JEN, *Regulatory proposal*, 30 April 2015, p. 98.

28 JEN, *2016 to 2020 electricity distribution price review regulatory proposal: Revocation and substitution submission*, 6 January 2016, p. 28.

29 JEN, *2016 to 2020 electricity distribution price review regulatory proposal: Revocation and substitution submission*, 6 January 2016, p. 34.

30 JEN, *Revocation and substitution submission Attachment 6-1 Rate of return, gamma, forecast inflation, and debt and equity raising costs*, 6 January 2016, pp. 29–41.

- use of the Guideline
- consideration of information before us.

3.3.1 National electricity and gas laws

In performing or exercising an economic regulatory function or power, we must do so in a manner that will or is likely to contribute to the NEO.[31] The NEO states:

> The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to —
>
> (a) price, quality, safety, reliability and security of supply of electricity;
>
> (b) and the reliability, safety and security of the national electricity system.

When we make a distribution determination, and set the rate of return we are exercising economic regulatory functions or powers.

In addition, we must take into account the RPPs when we exercise discretion.[32] In the context of the rate of return decision, we take particular account of the following RPPs:

- A service provider should have a reasonable opportunity to recover at least the efficient costs the operator incurs in providing direct control network services.[33]
- A service provider should have effective incentives to promote economic efficiency in the direct control network services that it provides. That economic efficiency should include efficient investment in the electricity system, efficient provision of electricity network services, and the efficient use of the electricity system.[34]
- A price or charge should allow for a return that matches the regulatory and commercial risks involved in providing the regulated service to which that charge relates.[35]
- The economic costs and risks of the potential for under or over investment by a service provider in a distribution or transmission system that the service provider uses to provide regulated network services.[36]
- The economic costs and risks of the potential for under or over utilisation of a distribution or transmission system that the service provider uses to provide regulated network services.[37]

31 NEL, s. 16(1)(a), NGL, s. 23.
32 NEL, s. 16(2); NGL, s. 28(2)(a)(i).
33 NEL, s. 7A(2); NGL, s. 24(2)(a).
34 NEL, s. 7A(3); NGL, s. 24(3).
35 NEL, s. 7A(5); NGL, s. 24(5).
36 NEL, s. 7A(6); NGL, s. 24(6).
37 NEL, s. 7A(7); NGL, s. 24(7).

3.3.2 The overall rate of return

The rules require we determine the allowed rate of return for a regulatory year as a weighted average of the return on equity for the regulatory control period in which that regulatory year occurs and the return on debt for that regulatory year. This must be determined on a nominal vanilla basis that is consistent with the estimate of the value of imputation credits.[38] In determining the allowed rate of return, we must have regard to the desirability of consistent application of financial parameters that are relevant or common to the return on equity and debt.[39]

The rules require that we estimate the return on equity for a regulatory control period such that it contributes to the achievement of the ARORO. In estimating the return on equity, we have regard to the prevailing conditions in the market for equity funds.[40]

We must determine the return on debt for a regulatory year such that that it contributes to the achievement of the ARORO.[41] We may estimate the return on debt using a methodology which results in the return on debt (and consequently the allowed rate of return) being or potentially being, different for different regulatory years in the regulatory control period.[42] In estimating the return on debt we have regard to the following factors:

- the desirability of minimising any difference between the return on debt and the return on debt of a benchmark efficient entity referred to in the ARORO.
- the interrelationship between the return on equity and the return on debt.
- the incentive that the return on debt may provide in relation to capital expenditure over the regulatory control period, including as to the timing of capital expenditure.
- any impacts (including in relation to the costs of servicing debt across regulatory control periods) on a benchmark efficient entity referred to in the ARORO that could arise as a result of changing the methodology that is used to estimate the return on debt from one regulatory control period to the next.[43]

3.3.3 Allowed rate of return objective

We are to determine the allowed rate of return such that it achieves the ARORO. The objective is:[44]

> …that the rate of return for a distribution network service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity

[38] NER, cl. 6.5.2(d); NER, cl. 6A.6.2(d); NGR, r, 87(4).
[39] NER, cl. 6.5.2(e), NER cl, 6A.6.2(e); NGR, r. 87(5).
[40] NER, cl 6.5.2(g); NER, cl 6A.6.2(g); NGR, r. 87 (7).
[41] NER, cl. 6.5.2 (h); NER, cl. 6A.6.2(h); NGR, cl. 87(8).
[42] NER, cl. 6.5.2 (i); NER, cl. 6A.6.2(i)(2); NGR, cl. 87(9)(b).
[43] NER, cl. 6.5.2 (k)(4); NER, cl. 6A.6.2(k)(4); NGR, cl. 87(11)(d).
[44] NER, cl. 6.5.2(c); NER, cl. 6A.6.2(c); NGR r. 87(3).

> with a similar degree of risk as that which applies to the distribution network service provider in respect of the provision of standard control services.

The regulatory regime is an ex-ante (forward looking) regime.[45] As such, we consider a rate of return that meets the ARORO must provide ex-ante compensation for efficient financing costs.[46] This return would give a benchmark efficient entity a reasonable opportunity to recover at least its efficient financing costs. This is a zero net present value (NPV) investment condition, which can be described as follows:[47]

> 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.

Under our regulatory framework, a benchmark efficient entity's assets are captured in its RAB. The return on capital building block allows a benchmark efficient entity to finance (through debt and equity) investment in its network.[48] Because investments usually carry a degree of risk, to satisfy the zero NPV condition the allowed rate of return must be sufficient to compensate a benchmark efficient entity's debt and equity investors for the risk of their investment.[49]

Elements of the ARORO—efficient financing costs

A key concept in the ARORO is 'efficient financing costs'. Because the market for capital finance is competitive, a benchmark efficient entity is expected to face competitive prices in the market for funds. Therefore, we consider efficient financing costs are reflected in the prevailing market cost of capital (or WACC) for an investment with a similar degree of risk as that which applies to a service provider in respect of the provision of regulated services.[50] As Alfred Kahn stated, 'since the regulated company must go to the open capital market and sell its securities in competition with every other would-be issuer, there is clearly a market price (a rate of interest on borrowed

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45 The AEMC describes, 'allowed revenues for network businesses are now set using the expenditure required by prudent, efficient operators as a benchmark. Companies have incentives to beat the benchmarks so they can keep some of their savings and pass the rest on to customers'. See AEMC, *Overview 2014–15*.

46 See section H.2.1 of Appendix H.

47 Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 14.

48 This includes both new and existing investment.

49 This risk is based on the risk of the underlying assets (that is, the RAB). See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 18, 22.

50 See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 15. We note the cost of capital (from a firm's perspective) is also known as investors' required rate of return (from an investors' perspective).

funds, an expected return on equity) that it must be permitted and enabled to pay for the capital it requires'.[51]

We consider employing a rate of return that is commensurate with the prevailing market cost of capital (or WACC) is consistent with the zero NPV investment condition (see above). We also consider economic efficiency more generally is advanced by employing a rate of return that reflects rates in the market for capital finance.[52] Similarly, Partington and Satchell interpret efficient financing costs as the opportunity cost of capital, which is a market rate of return for assets with a given level of risk.[53]

Elements of the ARORO—benchmark efficient entity

A key concept in the ARORO is a 'benchmark efficient entity'. It is essential to recognise the context in which this term is used. The ARORO aims at setting *the efficient financing costs* of a benchmark efficient entity *with a similar degree of risk as that which applies to the service provider in respect of the provision of standard control services*. Given this, three important concepts to consider are: 'risk', 'similar' and 'standard control services'. Having understood these concepts, we can better understand a benchmark efficient entity to give effect to the ARORO.

'Risk'

The risk of a benchmark efficient entity is a core element of the rate of return due to the important relation between risk and required returns in finance theory. Risk is the degree of uncertainty about an event—such as the uncertainty around the expectation of the return on an investment.[54] It is strictly a forward looking concept as no event is uncertain after it has occurred.

'Risk' has a specific meaning in finance theory. As such, it is important to apply this specific meaning in setting a rate of return that achieves the ARORO. In finance, there are two distinct types of risk—systematic (market or non-diversifiable) and non-systematic (firm-specific or diversifiable). That is, in finance:[55]

> The risk of any share can be broken down into two parts. There is the *unique risk* that is peculiar to that share, and there is the *market risk* that is associated with market-wide variations. Investors can eliminate unique risk by holding a well-diversified portfolio, but they cannot eliminate market risk. *All* the risk of a full diversified portfolio is market risk.

Similarly, McKenzie and Partington advise:[56]

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[51] Kahn, A.E., 'The economics of regulation: Principles and institutions', The MIT Press, Massachusetts, 1988, p. 45.

[52] See section H.1.1 and H.2.1 of Appendix H.

[53] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 15.

[54] Bishop, S., Faff, R., Oliver, B., Twite, G., 'Corporate Finance', Ed. 5 Pearson Prentice Hall, 2004, p. 577.

[55] Brealey, R., Myers, S., Partington, G., Robinson, D., 'Principles of corporate finance', 2007, The McGraw-Hill Companies Inc., 2007, p. 201.

[56] McKenzie, M., Partington, G., *Risk, asset pricing models and WACC*, June 2013, p. 10.

> modern finance theory specifies that the risk to be compensated via the WACC is the non-diversifiable, or systematic, component of total risk (in simple terms, that risk which cannot be eliminated by holding stocks in a well diversified portfolio). This risk is measured as covariance, or equivalently beta, risk.

The rate of return allows a benchmark efficient entity to compensate investors for the risk of committing capital to fund investments in its network. We do not consider investors require compensation for all risk facing a benchmark efficient entity. In setting the allowed return on equity, we provide compensation for the systematic risk that a benchmark efficient entity would face through the equity beta (see section 3.4.1). The equity beta under the Sharpe–Lintner capital asset pricing model (CAPM) measures systematic risk as the sensitivity of an asset or business[57] to the overall movements in the market. It does this by measuring the standardised correlation between the returns on this asset or business with that of the overall market.[58] The key risks for debt holders are systematic (beta) risk, credit risk (the risk of default and credit rating downgrades) and liquidity risk.[59] In setting the allowed return on debt, we provide compensation for a benchmark efficient entity's efficient costs from facing these risks, as they are included in the promised returns we observe using Bloomberg and RBA data.[60]

As such, when looking at the risks of supplying standard control services, it is important to differentiate between risk that is to be compensated through the allowed rate of return (compensable risk) and non-compensable risk. When developing the Guideline, we commissioned Frontier to explore these risks and to provide advice on what risks we should compensate service providers for through the allowed rate of return.[61]

We accept the ARORO requires us to set an allowed rate of return that compensates for the efficient financing costs of a benchmark firm for bearing a similar degree of compensable risk as that which applies to the network service provider in respect of the provision of the relevant regulated services. This will reflect an ex-ante return that includes a risk premium over the risk free rate for bearing this level of compensable risk.

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57 Theoretically, this asset or business is 'a benchmark efficient entity'. In practice, we use a sample of businesses we consider comparable to a benchmark efficient entity to calculate equity beta (see section 3.4.1).

58 McKenzie, M., Partington, G., *Risk, asset pricing models and WACC*, June 2013, p. 21; Brealey, R., Myers, S., Partington, G., Robinson, D., 'Principles of corporate finance', 2007, The McGraw-Hill Companies Inc., 2007, p. 107.

59 McKenzie, M., Partington, G., *Risk, asset pricing models and WACC*, June 2013, p. 14.

60 We observe the promised returns of debt issued by a sample of firms we consider comparable to a benchmark efficient entity based on the benchmark credit rating and term. In practice, we may overcompensate a benchmark efficient entity for these risks as we observe broad BBB debt whereas we consider a benchmark efficient entity would issue BBB+ debt.

61 Frontier, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia*, July 2013.

'Similar'

A benchmark efficient entity is to have a similar degree of risk as that which applies to the network service provider in respect of the provision of the relevant regulated services.[62] As such, when developing the Guideline, we looked at the concept of 'a similar degree of risk' in some detail. We also sought advice from Frontier Economics on the risks to which energy network service providers are exposed in delivering regulated services.[63] We concluded the compensable risks facing the different service providers[64] were 'similar' for the purposes of characterising a benchmark efficient entity.[65] For this analysis, see chapter three of the Guideline's explanatory statement.[66]

'Standard control services'

The allowed rate of return is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect to the provision of standard control services.[67] As such, it is important to understand how the rules characterise 'standard control services'.

The rules define standard control services as a direct control service that is subject to a control mechanism based on a service provider's total revenue requirement.[68] The rules define a direct control service as a direct control network service within the meaning of section 2B of the NEL.[69] The NEL then specifies (underline added):[70]

> A direct control network service is an electricity network service—
>
> > (a) the Rules specify as a service the price for which, or the revenue to be earned from which, <u>must be regulated under a distribution determination or transmission determination</u>; or
> >
> > (b) if the Rules do not do so, the AER specifies, in a distribution determination or transmission determination, as a service the price for which, or the revenue to be earned from which, must be regulated under the distribution determination or transmission determination.

62 NER, cls. 6.5.2(c), 6A.6.2(c); NGR, r. 87(2)(3).

63 Frontier Economics, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia*, June 2013.

64 That is, gas, electricity, transmission and distribution service providers.

65 As discussed under the above heading 'similar', compensable risk refers to risk that is to be compensated through the allowed rate of return.

66 AER, *Better regulation: Explanatory statement to the rate of return guideline*, December 2013, pp. 32–45.

67 See NER 6.5.2(c). Instead of 'standard control services', the transmission rules refer to 'prescribed transmission services' and the NGR refers to 'reference services'. See NER 6A.6.2(c), NGR 87(3).

68 See NER v. 79, Chapter 10: 'Glossary', p. 1224. The NER describes 'prescribed transmission services under NER v. 79, Chapter 10: 'Glossary', p. 1201.

69 NER v. 79, Chapter 10: 'Glossary', p. 1151.

70 NEL, s. 2B.

Risk, regulation and a benchmark efficient entity

The rules specify that the allowed rate of return is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies:[71]

- to the service provider in which the decision relates (which will always be a business that is regulated under the rules and NEL/NGL)
- in respect to the provision of standard control services (which are regulated services by definition),[72] which can only be provided by businesses regulated under the rules.

As discussed under 'Risk' above, risk is the degree of uncertainty about an event. [73] For instance, investing in the share market is risky because there is a spread of possible outcomes. The usual measure of this spread is the standard deviation or variance.[74] Similarly, the risk of a benchmark efficient entity would be the uncertainty around its expected return. More specifically, the systematic or market risk of a benchmark efficient entity would be the uncertainty around its expected return relative to the expected returns on the market. We would measure this as the standardised correlation between a benchmark efficient entity's returns with that of the overall market (measured by the equity beta in the CAPM).[75]

Brealey et.al. use the figure we have presented as Figure 3-1 to illustrate the following.[76]

> Investments A and B both have an expected return of 10%, but because investment A has the greater spread of possible returns, it is more risky than B. We can measure this spread by the standard deviation. Investment A has a standard deviation of 15%; B, 7.5%. Most investors would prefer B to A. Investments B and C both have the same standard deviation, but C offers a higher expected return. Most investors would prefer C to B.

71 See NER 6.5.2(c). Instead of 'standard control services', the transmission rules refer to 'prescribed transmission services' and the NGR refers to 'reference services'. See NER 6A.6.2(c), NGR 87(3). Also see section 2B of the NEL.

72 The NER defines standard control services as: 'a direct control service that is subject to a control mechanism based on a Distribution Network Service Provider's total revenue requirement'.

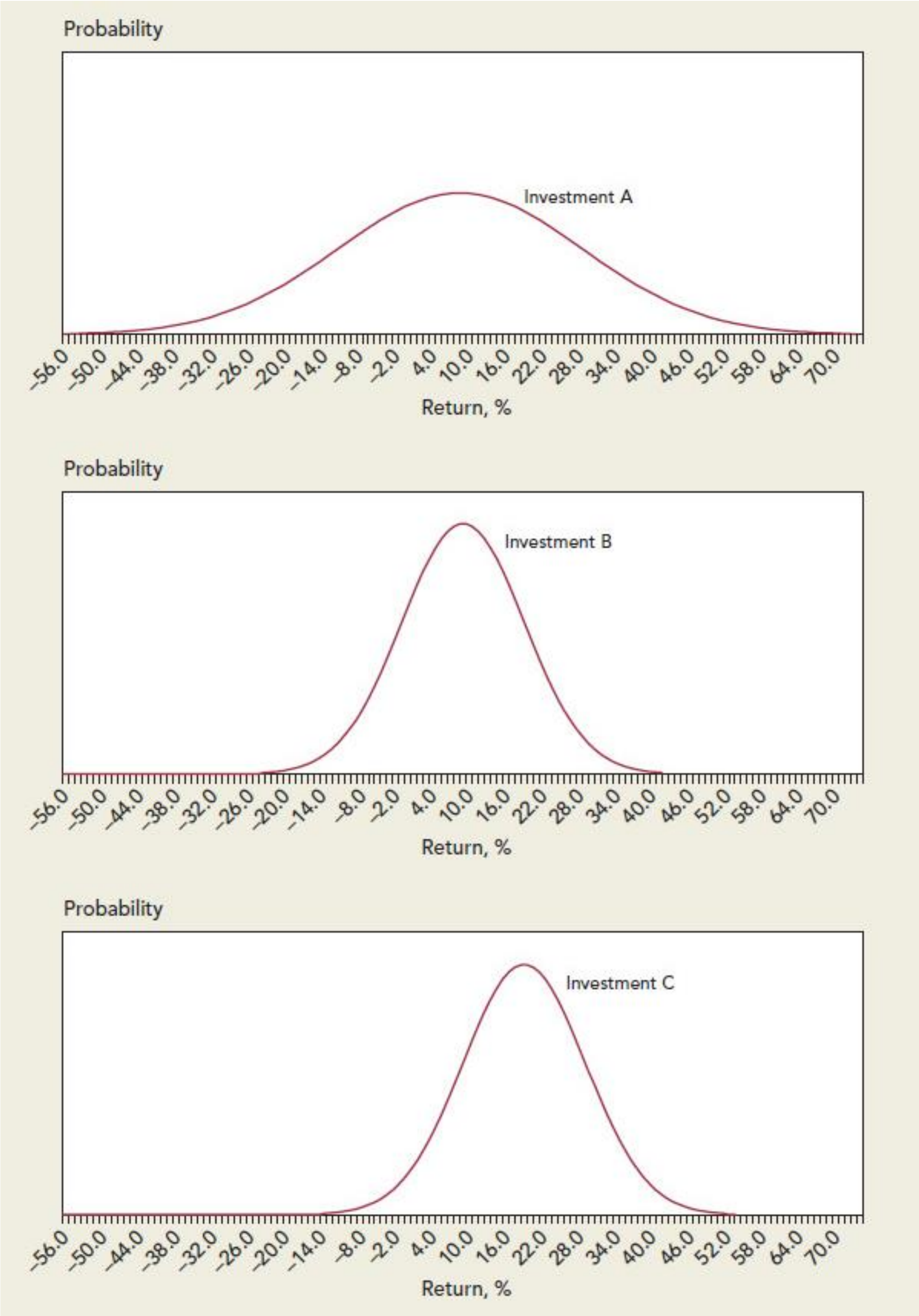
73 Bishop, S., Faff, R., Oliver, B., Twite, G., 'Corporate Finance', Ed. 5 Pearson Prentice Hall, 2004, p. 577.

74 Brealey, R., Myers, S., Partington, G., Robinson, D., 'Principles of corporate finance', 2007, The McGraw-Hill Companies Inc., 2007, p. 201.

75 McKenzie, M., Partington, G., *Risk, asset pricing models and WACC*, June 2013, p. 21; Brealey, R., Myers, S., Partington, G., Robinson, D., 'Principles of corporate finance', 2007, The McGraw-Hill Companies Inc., 2007, p. 107.

76 Brealey, R., Myers, S., Allen, F., 'Principles of corporate finance', 2011, Ed. 10, McGraw-Hill Irwin, Figure 8.2, p. 187.

Figure 3-1 Risk versus expected return



Source: Brealey, Myers, Allen (2011), Figure 8.2.

We use the above example to explain the relationship between risk and return for a single investment. Investors are generally assumed to prefer an investment with a lower variance for a given expected return under the assumption that investors are risk averse. However, we note that for an investment that is to be included in an investment portfolio the risk that is relevant to its price is the risk it will add to this portfolio. Therefore, under the assumption that investors hold fully diversified 'efficient' market portfolios, it is an investment's non-diversifiable (or systematic) risk that is relevant. In the case of equity investments, as discussed above, this is measured by the equity beta of the investment.

We consider a benchmark efficient entity *with a similar degree of risk as that which applies to the service provider in the provision of its regulated services* would be 'a pure play, regulated energy network business operating within Australia' acting efficiently.[77] To understand this position, it is essential to understand the relationship and distinction between risk and expected returns. All else being equal, we consider an unregulated monopoly will have higher risk and higher expected returns than a regulated monopoly. This is because regulation:

- mitigates monopolies from being able to extract monopoly rents, thereby constraining potential profits
- increases the certainty of the revenue stream, thereby reducing risk.

For clarity, regulation reduces both risks that are compensated through the rate of return (for example, demand risk) and risks that would not be compensated through the rate of return (for example, by allowing cost pass throughs for unsystematic risks such as industry-specific tax changes or geographic-specific natural disasters). We only focus on risks that are compensated through the rate of return (compensable risks).

Incentive regulation affects compensable risks by allowing service providers to earn more stable cash flows with periodic resets of revenues to better reflect actual expenditure. Most unregulated businesses do not have these same protections or restrictions, and so are likely to have a different systematic risk profile. We carefully considered this role when developing the Guideline when considering whether a benchmark efficient entity referred to in the context of the ARORO is likely to be regulated.[78] Frontier has also recognised the role of regulation in affecting risk in advising:[79]

> The form and nature of regulation applicable to Australian energy networks mitigates most of the business risks they face as compared to the business risks faced by other types of firms in the economy. Regulated revenues are set

[77] See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013,ch.3; AER, *Better regulation: Rate of Return Guideline,* December 2013, section 3.

[78] AER: *Better regulation: Explanatory statement to the rate of return guideline*, December 2013, pp. 32–45.

[79] Frontier Economics, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia*, July 2013, p. 4.

> on a periodic basis and changes in volumes may only affect the timing of revenues (under a revenue cap). Even where revenues fall short of expectations due to lower volumes (as under a price cap), the lower volumes imply that costs would probably also have been lower than expected. Unanticipated or poorly-managed changes in costs are partly borne by customers and only partly by the network business through the building block form of incentive regulation that applies. Stranding and optimisation risks are minimal for energy networks, a complete contrast to businesses operating in other sectors.

Consumer Challenge Sub-Panel 3 (CCP3) also recognised this in highlighting the need to take into account the protections provided under the regulatory framework when making assessments about a benchmark efficient entity with a similar degree of risk as a service provider. These included risk reductions arising from:[80]

- a revenue cap, which removes volume risk
- the indexation of the RAB, which protects the value of the underlying assets even when they might otherwise be written down in a commercial environment
- the progressive transition to a 10-year trailing average, including annual updating of the return on debt.

Many of the risks that the regulatory regime affects are systematic and therefore affect the cost of capital (or rate of return). From being inherently less exposed to systematic risk, regulated service providers have lower equity betas than if they were unregulated and therefore lower costs of equity. Also, given their lower risk cash flows, regulated service providers might issue a higher proportion of debt than if they were unregulated. This reduces their cost of capital if debt is cheaper than equity, for example due to taxes or other market imperfections. As a result, we consider a benchmark efficient entity faces lower compensable risk than would otherwise be the case absent regulation. As such, it would have a lower cost of capital.

Some systematic risks that regulation reduces include:

- Demand risk: the revenue or price setting mechanism mitigates demand risk. Under a price cap, service providers may mitigate the risk of forecast error by restructuring tariffs, such that higher fixed charges are set to offset falls in demand. Under a revenue cap, where forecast quantity demanded differs from actual quantity demanded, service providers are made whole for any variation through price adjustments in subsequent years. Further, in most cases, a transmission service provider will determine prices based on historical demand which reduces intra year revenue variations. This effectively mitigates the risk associated with demand volatility.

80 See CCP3, *Submission to the AER: An Overview — Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for a revenue reset for the 2016-2020 regulatory period*, 22 February 2016, p. 31.

- Inflation risk: Regulated service providers face less inflation risk than unregulated businesses. Under the regulatory framework, they effectively expect to receive a real return on their investments in their RABs and to also have their RABs indexed for actual inflation.
- Interest rate risk: Both regulated and unregulated service providers are exposed to interest rate risk. The regulatory framework effectively moves risk of interest rate movements impacting financing costs onto customers. Where service providers raise capital during the averaging period/s that they know in advance they can further limit their exposure to this risk. To the extent they are unable to raise capital over the averaging period/s, they can still materially reduce their exposure to interest rate risk by hedging the base rate.

Table 3-3 summarises a selection of provisions in the rules that have the effect of mitigating various systematic and non-systematic risks.

Table 3-3: Key clauses in the rules that mitigate systematic risk

Rule	Effect on risk
6.3.2(b)	The term of each regulatory control period is at least 5 years, providing a fixed duration in which a service provider has a regulated return on its assets, revenue certainty, and fixed terms of access for its services.
6.2.6	The AER adopts a control mechanism formula to calculate the total revenue that service providers may collect over a regulatory control period (and for each year of a regulatory control period). This control mechanism automatically accounts for indexation and annual increases in efficient input costs. The control mechanism that the AER adopts (typically in the form of a revenue cap), also ensures a service provider has a guaranteed level of total revenue that it may collect across the regulatory control period, regardless of unexpected changes in demand. This significantly limits risks to revenue.
6.5.9	X factors in the control mechanism smooth revenues across the regulatory control period and limit shocks from the last year of a regulatory control period before the start of the next. The AER sets X factors, among other things, to allow service providers to recover a revenue shortfall in one year in a subsequent year. Through X factors, service providers have a stable and certain level of revenue over each regulatory l period, with reduced risks of short term revenue volatility.
6.18	The prices service providers may charge annually are certain. They are set through a regulatory process to approve annual pricing proposals.
6.4.3(a)(1)-(3), 6.5.1, 6.5.2, 6.5.5, S6.2.1, S6.2.2B, S6.2.3,	The total revenue that the AER determines incorporates a return on and of the service provider's asset base. The historical asset base rolls forward from one regulatory control period to the next and from year to year within each regulatory control period. The NER guarantees recovery of historical asset costs through depreciation, the earning of a return on the asset base, indexation and recovery of future efficient capex. This substantially lessens risks in capital investment that might otherwise apply to a business operating in a workably competitive market. An asset that is not utilised or productive may still provide a return under the NER through the setting and rolling forward of the asset base, the return on and of the asset base and the application of indexation.
6.5.2	The AER sets the rate of return on the asset base by reference to the risks faced by the service provider. The AER updates this each regulatory control period to account for changed market conditions.
6.5.3	Provision for tax in determining total revenue is required regardless of whether the service provider pays tax.
6.5.6 and 6.5.7	The AER assesses expenditure requirements for each service provider by reference to the amount necessary to meet a set of standards and objectives. These include the need to meet the expected demand for services and to meet quality, reliability, security, and safety standards. The

	AER does not assess expenditure by reference to the capacity of consumers to pay. This removes risks that could otherwise arise in providing a reliable and safe service. The AER reassesses the requirements of service providers for each regulatory control period to account for changes in market conditions and trends.
6.5.10	Allows service providers to pass through certain costs to consumers in circumstances where this might not be possible in a workably competitive market. For instance, the pass through provisions provide for a pass through of costs that arise through regulatory change.
6.5.7(f), 6.6A, chapter 5	Establishes a planning regime for DNSPs that assists in predicting future costs and appropriate planning for changes in the commercial environment. This includes provision for contingent projects during a regulatory control period and longer term projects through the RIT-D process.
6.20, 6.21, 6.6.1(a1)(d), and RoLR provisions	Provides for a statutory billing and settlements framework with prudential requirements (and other similar provisions) to minimise financial risk associated with providing and charging for services. There is also provision for dealing with potential risks associated with retailer insolvency.

Source: NER, AER analysis.

Outcomes of a workably competitive market

For clarity, we consider the regulatory regime should seek to replicate the outcomes of a workably competitive market to the extent possible (notwithstanding that this is not an explicit requirement of the rules nor the NEL/NGL). We consider that this would entail replicating (to the extent possible while achieving the objectives of regulation) outcomes that a workably competitive market would theoretically produce with respect to efficiency and the resulting prices and service levels.[81] Incentive regulation aims to replicate these outcomes where competition is not available to achieve this. We are in an environment where competition is not viable as energy network service providers are natural monopolies. Consistent with economic theory, 'the essence of natural monopoly is that there are increasing returns in production and that the level of demand is such that only a single firm can be profitable'.[82]

Incentive regulation aims to replicate workably competitive market outcomes by:

- Constraining monopoly rents by seeking for customers to only pay for efficient costs of providing the service. This results in service providers having a lower rate of return than if they were unregulated.
- Incentivising service providers to operate efficiently.

81 The basis for desiring a competitive market outcome in microeconomic theory stems from the theorems that a competitive equilibrium is Pareto-efficient and any Pareto-efficient allocation can be decentralised as a competitive equilibrium. This is where, in microeconomic theory, a 'competitive market equilibrium' is where firms' maximise their profits, consumers maximise their utilities and the market clears (there is no waste or undersupply). See Mas-Colell, A., Whinston, M.D., Green, J.R., *Microeconomic theory*, Oxford University Press, 2006, p. 314. It is worth noting that these theorems are derived from strong assumptions including an absence of externalities and market power, price taking behaviour and symmetric information. See for example Varian, H.R., *Intermediate micro economics: A modern approach*, ed. 7, W.W. Norton &Company, 1987, pp. 585; Hindriks, J., Myles, G.D., *Intermediate public economics*, The MIT Press, 2006, pp. 12–13.

82 Hindriks, J., Myles, G.D., *Intermediate public economics*, The MIT Press, 2006, p. 232.

Applying the first point to the allowed rate of return, the allowed rate of return should be consistent with the efficient financing cost of providing regulated services.[83] As we discuss above and in Appendix H, we consider the current (or prevailing) cost of capital to be the efficient cost of capital. Prevailing market rates for capital finance are expected to be competitive.[84] Prevailing market rates also represent the costs that other service providers will face to enter the market.[85]

Applying the second point to the allowed rate of return, we encourage services providers to operate efficiently by setting an allowed rate of return that:

- Does not distort investment decisions. This differs from cost of service regulation, which entails compensating service providers for their actual costs no matter how inefficient.
- Is consistent with the expected return in the competitive capital market (determined by demand and supply) for an investment of similar degree of risk as a service provider supplying regulated services.
- Incentivises service providers to seek the lowest cost financing (all else being equal).

For clarity, promoting an efficient competitive outcome would not necessarily entail assuming a benchmark efficient entity would conduct all of its activities as we would imagine an unregulated firm would. As before, an unregulated benchmark efficient entity would be a natural monopoly. As Partington and Satchell advise, an unregulated benchmark with monopoly power is not appropriate because, 'if the benchmark entity is an unregulated firm which has monopoly power, then it will be extracting economic rents'.[86]

3.3.4 Return on debt factors in the rules

The rules require that we must have regard to the following factors in estimating the return on debt:[87]

- The desirability of minimising any difference between the return on debt and the return on debt of a benchmark efficient entity referred to in the ARORO.[88] We understand this factor to mean the difference between the return on debt allowance and the cost of debt a benchmark efficient entity would incur. For clarity, we do not consider this factor relates to minimising the difference between the return on debt

[83] That is, standard control services as referred to in NER 6.5.2(c), prescribed transmission services as referred to in NER 6A.6.2(c), or 'reference services' as referred to in NGR 87(3).

[84] Kahn, A.E., 'The economics of regulation: Principles and institutions', The MIT Press, Massachusetts, 1988, p. 45.

[85] In a competitive market, prices are theoretically constrained by entry or the threat of entry. See HoustonKemp, *Memo: Appropriate objective to guide the setting of the cost of debt allowance*, 3 March 2015, p. 1. This is also implied in Chairmont, *Cost of debt comparative analysis*, November 2013, p. 4.

[86] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 49.

[87] NER, cl. 6.5.2(k) and cl. 6A.6.2(k); NGR, r.87(11)

[88] NER, cl.6.5.2(k)(1) and cl.6A.6.2(k)(1); NGR, r.87(11)(a),

allowance and the actual cost of debt incurred by an actual service provider. The actual cost of debt of an actual service provider is relevant only to the extent it reflects the cost of debt incurred by a benchmark efficient entity.

- The interrelationship between the return on equity and the return on debt.[89]
- The incentives that the return on debt may provide in relation to capital expenditure over the regulatory control period, including as to the timing of any capital expenditure.[90]
- Any impacts (including in relation to the costs of servicing debt across regulatory control periods) on a benchmark efficient entity referred to in the ARORO that could arise as a result of changing the methodology that is used to estimate the return on debt from one regulatory control period to the next.[91]

Of these factors above, the latter is particularly relevant. This is because the methodology for estimating the return on debt in this decision is a change from the methodology used in the previous regulatory control period.[92]

Our transition between the two methodologies is 'revenue neutral' in a present value sense. It prevents 'wealth transfers'[93] flowing between a benchmark entity and its consumers because of the change in methodology. This mitigates any impacts on a benchmark efficient entity that could arise as a result of changing the methodology that is used to estimate the return on debt from one regulatory control period to the next.

If we change our method for estimating the return on debt without a transition, this would change the allowed return on capital cash flows relative to a continuation of the current (on-the-day) approach. This would change the present value of a benchmark efficient entity (which is based on the present value of these expected future cash flows), and this change would only arise due to a change in methodology. Changing the value of a benchmark efficient entity would only contribute to the achievement of the ARORO if it would be under- or over-valued under the continuation of the current (on-the-day) methodology. There is no evidence before us to indicate the on-the-day approach would have, or would continue to, under- or over-value a benchmark efficient entity. Rather, we consider the on-the-day approach contributes to the achievement of the ARORO. This means it would not have, nor would it continue to, under- or over-

89 NER, cl.6.5.2(k)(2) and cl.6A.6.2(k)(2); NGR, r.87(11)(b).

90 NER, cl.6.5.2(k)(3) and cl.6A.6.2(k)(3); NGR, r.87(11)(c).

91 NER, cl.6.5.2(k)(4) and cl.6A.6.2(k)(4); NGR, r.87(11)(d).

92 AER, *Final decision—Queensland distribution determination 2010–11 to 2014–15*, May 2010, pp. 252–253; AER, *Final decision—Victorian electricity network distribution service providers: Distribution determination 2011–2015*, p. 496; AER, *Final decision— Envestra Ltd: Access arrangement proposal for the SA gas network,* June 2011, pp. 55, 58; AER, Final decision— *Access arrangement proposal: ACT, Queanbeyan and Palerang gas distribution network*, March 2010, pp. 40, 57; AER, *Final decision—NT Gas: Access arrangement proposal for the Amadeus Gas Pipeline August 2011 to June 2016*, July 2011, p. 78.

93 See Partington, G., Satchel, S., *Report to the AER: Discussion on the allowed cost of debt*, 5 May 2016, pp. 41, 52.

value a benchmark efficient entity. On this basis, we consider any transition must be revenue neutral relative to the continuation of the on-the-day methodology.

Further, the rules require that if the return on debt methodology results in an estimate that is, or could be, different for different regulatory years, then the resulting change to the service provider's total revenue must be effected through the automatic application of a formula that is specified in the decision for that regulatory control period.[94] We address this in our section on debt implementation.

3.3.5 Rate of return Guideline

This section sets out the role and key elements of the Guideline. The explanatory statement (and appendices) to the Guideline explain our proposed approach in detail which we adopt for this section.[95]

Role of the Guideline

Our task is to estimate an allowed rate of return that achieves the ARORO rather than to merely apply the Guideline. Nevertheless, the Guideline has a significant role because any decision to depart from the Guideline must be a reasoned decision.[96] Similarly, service providers must provide reasons for any proposed departures from the Guideline.[97] In practice, we have considered submissions on the rate of return made during this determination process anew so that we are satisfied that our estimate of the rate of return achieves the ARORO. Where we receive no new material or there is no reason to change our Guideline approach, we maintain our view and reasons set out in the Guideline.

Further, whilst the legislative framework allows us to depart from the Guideline, we would not do so lightly. This is because departing from it may undermine the certainty and predictability that stakeholders have said they value.[98] However, we would depart from the Guideline if we are satisfied that doing so would result in an outcome that better achieves the ARORO. We consider our approach is consistent with the AEMC's view that, 'the regulator would, in practice, be expected to follow the guidelines unless there had been some genuine change in the evidence'.[99]

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94 NER cl. 6.5.2(l) and cl. 6A.6.2(l), NGR, r.87(12).

95 The full suite of documents associated with the guideline including the explanatory statements, relevant appendices and expert reports are available at http://www.aer.gov.au/node/18859.

96 NGR, cl. 87(18); NER, cl. 6.2.8(c).

97 NER, cl. S6.1.3(9),(9A),(9B).

98 A group of investors and ENA again raised the importance of certainty in Financial Investors Group*, Submission on AER's equity beta issues paper*, 29 October 2013; ENA, *Response to the Draft Rate of Return Guideline of the AER*, 11 October 2013, p. 1.

99 AEMC, *Final Position Paper, National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012; National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012*,15 November 2012, p. 28.

Consistent with the rules, we published the Guideline setting out the estimation methods, financial models, market data and other evidence that we propose to take into account in estimating the allowed return on equity, allowed return on debt and the value of imputation tax credits.[100] The Guideline specifies:[101]

- the methodologies we propose to use to estimate the allowed rate of return (derived from the allowed return on equity and debt) for electricity and gas network businesses
- the method we propose to use to estimate the value of imputation tax credits used to establish a benchmark corporate income tax allowance (see attachment on the value of imputation credits)
- how these methods will result in an allowed return on equity and return on debt which we are satisfied achieves the ARORO.

Due to this, the Guideline provides transparency and predictability for service providers, users and investors as to how we consider changes in market circumstances and make decisions. At the same time, it allows sufficient flexibility for us to account for changing market conditions at the time of each regulatory determination or access arrangement.

In developing the Guideline, we also undertook an extensive consultation process that resulted in addressing the relevant issues. We summarised this consultation process in several recent decisions.[102] Details of the Guideline development process are also on our website.[103]

Key elements of the Guideline

The Guideline provides transparency on how we propose to estimate key components of the allowed rate of return. We summarise these below.

Application of criteria for assessing information

We developed a number of criteria and applied these to inform our regulatory judgement when evaluating material put before us. The criteria are subordinate to the law, the rules and especially the ARORO. We developed them to provide stakeholders greater certainty as to how we intend to exercise our regulatory judgement whilst keeping sufficient flexibility to make decisions consistent with changing market conditions.[104]

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100 NER, cl. 6..5.2 (n)(2); NER, cl. 6A.6.2(n)(2); NGR, cl. 87(14)(b). See http://www.aer.gov.au/node/18859

101 NER, cl. 6.5.2 (n), NER, cl. 6A.6.2(n); NGR, cl. 87(14).

102 For example, see AER, *Final decision: Energex determination 2015–16 to 2019–20, Attachment 3—Rate of return*, October 2015, pp. 22–24.

103 The full suite of documents associated with the Guideline including the explanatory statements, relevant appendices and expert reports are available at http://www.aer.gov.au/node/18859.

104 See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013, ch.2.

We proposed to apply assessment criteria to guide our selection and use of estimation methods, models, market data and other evidence which inform our assessment of the overall rate of return. Not all the various estimation methods, financial models, market data and other evidence (information) will be of equal value in determining the rate of return by reference to a benchmark efficient entity with a similar degree of risk to the service provider in relation to the provision of its regulated services. For example, some information may be more relevant, more feasible to construct, or more reliable than others. We considered that our decisions on the rate of return are more likely to contribute to the achievement of the ARORO because we use estimation methods, financial models, market data and other evidence that are:

(1) where applicable, reflective of economic and finance principles and market information

    (a) estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data

(2) fit for purpose

    (a) the use of estimation methods, financial models, market data and other evidence should be consistent with the original purpose for which it was compiled and have regard to the limitations of that purpose

    (b) promote simple over complex approaches where appropriate

(3) implemented in accordance with good practice

    (a) supported by robust, transparent and replicable analysis that is derived from available credible datasets

(4) where models of the return on equity and debt are used these are

    (a) based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in inputs estimation

    (b) based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound rationale

(5) where market data and other information is used, this information is

    (a) credible and verifiable

    (b) comparable and timely

    (c) clearly sourced

(6) sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.

We applied these criteria in this decision to guide us in deciding on the merits of the material before us and the best place to employ the material (if at all).

Benchmark efficient entity

We generally see a benchmark efficient entity with a similar degree of risk as that applying to the service provider in respect of the provision of standard control services as being 'a pure play, regulated energy network business operating within Australia'. This includes the following components:[105]

- Pure play: An entity that offers services focused in one industry or product area. In this context, the industry is energy network services and, in particular the services are regulated energy network services.
- Regulated: An entity is subject to economic regulation (that is, revenue or price cap regulation) that makes it comparable for the purposes of assessing risk in the provision of regulated services. Comparable risk is an important component of the ARORO.
- Energy network business: Energy network refers to a gas distribution, gas transmission, electricity distribution or electricity transmission business.
- Operating in Australia: An entity operating within Australia as the location of a business determines the conditions under which the business operates. This includes the regulatory regime, tax laws, industry structure and broader economic environment.

Gearing

We base the weight to give to the point estimates of the return on equity and the return on debt to derive the overall rate of return on our gearing ratio point estimate of 60 per cent. We give 60 per cent weight to debt and 40 per cent to equity.[106]

Return on equity

We proposed to estimate the allowed return on equity using the six steps set out in the flow chart in Figure 3-2. For the reasons for adopting this process, see the documents and submissions considered during the different stages of developing the Guideline. These include our issues paper and consultation paper and draft and final explanatory statements to the Guideline.[107]

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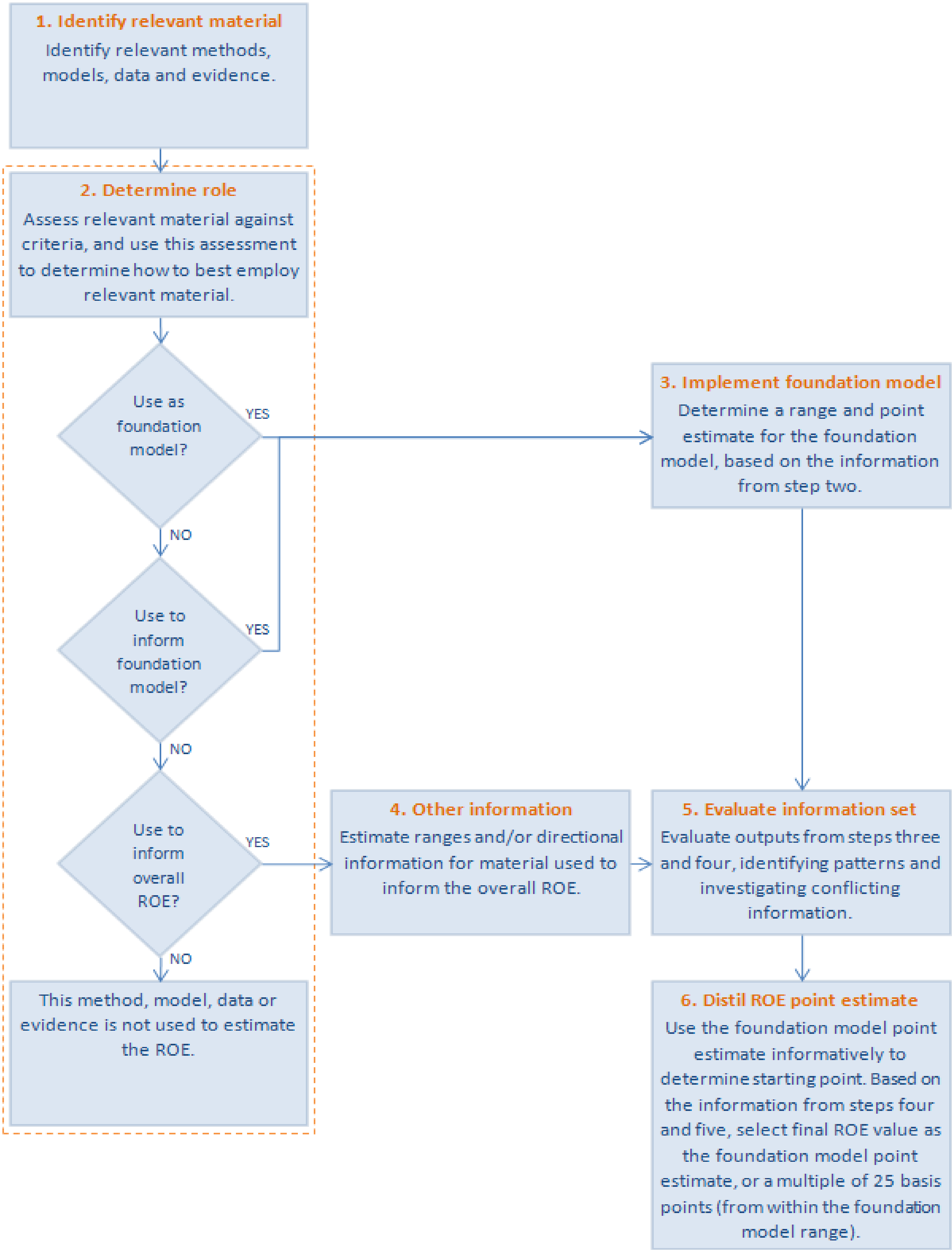
[105] See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013,ch.3; AER, *Better regulation: Rate of Return Guideline,* December 2013, section 3.

[106] See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013, Appendix F.

[107] Available at, http://www.aer.gov.au/node/18859.

Figure 3-2 Flowchart of the AER's proposed approach to estimating the allowed return on equity



Return on debt

We proposed to:

- estimate a return on debt using the on-the-day approach (that is, based on prevailing market conditions near the commencement of the regulatory control period) in the first regulatory year (2016) of the 2016–20 regulatory control period, and
- gradually transition this approach into a trailing average (that is, a moving historical average) over 10 years by annually updating 10 per cent of the return on debt to reflect prevailing market conditions in that year.[108]

We also proposed to estimate the return on debt in each regulatory year by reference to:

- a benchmark credit rating of BBB+
- a benchmark term of debt of 10 years
- independent third party data series—specifically, a simple average of the broad BBB rated debt data series published by the RBA and Bloomberg, adjusted to reflect a 10 year estimate and other adjustments[109]
- an averaging period for each regulatory year of between 10 business days and 12 months (nominated by the service provider), with that period being as close as practical to the start of each regulatory year and also consistent with other conditions that we proposed in the Guideline.[110]

Mid period WACC adjustment

We proposed to annually update the overall rate of return estimate because we are required to update the return on debt annually.[111] We recently published amendments to the transmission and distribution post tax revenue model (PTRM) to enable applying annual updates.[112]

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108 This final decision determines the return on debt methodology for the 2016–20 period. This period covers the first five years of the 10 year transition period. This decision also sets out our intended return on debt methodology for the remaining six years. However, we do not have the power to determine in this decision the return on debt methodology for those years. Under the NER, the return on debt methodology must be determined in future decisions that relate to that period.

109 In the Guideline, we proposed to use one or more third party data series to estimate of the return on debt. However, at that time we had not formed a view on which data series to use. We form our view following a separate consultative process. This consultative process started with the release of an issues paper in April 2014. We do not propose estimating the return on debt by reference to the Reuters curve that was first proposed in the recent revised proposals. However, we will consider using this new source of information in future determinations following a proper period of consultation.

110 AER, *Rate of return guideline*, December 2013, pp. 21–2; AER, *Explanatory statement—Rate of return guideline*, December 2013, p. 126.

111 NER, cl. 6.5.2(i); NER, cl. 6A.6.2(i); NGR r. 87(9).

112 Available at http://www.aer.gov.au/node/27616.

3.3.6 Interrelationships

In determining the allowed rate of return, we must have regard to any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt.[113] In this section, we discuss the key interrelationships in our rate of return decision. The Guideline also describes these interrelationships in detail where we have had regard to them in developing our approach. The manner in which we consider these interrelationships is also set out as part of our reasoning and analysis in appendices to this attachment.

We estimate a rate of return for a benchmark efficient entity which is then applied to a specific service provider, rather than determining the returns of a specific service provider based on all of its specific circumstances.[114] This is the same whether estimating the return on equity or return on debt as separate components. We set a rate of return that is commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as the service provider in respect of the provision of standard control services. This provides a reasonable opportunity to recover at least the efficient financing costs of providing those services.[115] The service providers' actual returns could differ from those of a benchmark entity depending on how efficiently it operates its business. This is consistent with incentive regulation. That is, our rate of return approach drives efficient outcomes by creating the correct incentive by requiring service providers to retain (fund) any additional income (costs) by outperforming (underperforming) the efficient benchmark.[116]

We apply a benchmark approach and an incentive regulatory framework. One should not view any component or relevant parameter adopted for estimating the rate of return in isolation. In developing our approach and implementing it to derive the overall rate of return we are cognisant of a number of interrelationships relating to the estimation of the return on equity and debt and underlying input parameters.

A benchmark

In the Guideline and for this decision, we have adopted a hypothetical benchmark efficient entity that is common across all service providers. In deciding on a benchmark we considered the different types of risks and different risk drivers that may have the potential to lead to different risk exposures for different businesses in the provision of their services. We also noted that the rate of return compensates investors only for non–diversifiable risks (systematic risks) while other types of risks are compensated via cash flows and some may not be compensated at all.[117] These interrelationships between the types of risk and the required compensation via the rate of return are an

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[113] NER, cl. 6.5.2(e); NER, cl. 6A.6.2(e); NGR r. 87(9).

[114] See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013, ch.3.

[115] NEL, s. 7A(2); NGL s. 24(2)(a).

[116] NEL, s. 7A(3); NGL s. 24(2)(b).

[117] See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013, p.33.

important factor.[118] After careful analysis, our view is that a benchmark efficient entity would face a similar degree of risk to each of the service providers irrespective of the:

- energy type (gas or electricity)
- network type (distribution or transmission)
- ownership type (government or private)
- size of the service provider (big or small).

Domestic market

We generally consider that the Australian market is the market within which a benchmark efficient entity would operate to make it properly comparable in degree of risk to a service provider. This recognises that the location of a business determines the conditions under which the business operates and these include the regulatory regime, tax laws, industry structure and broader economic environment. As most of these conditions will be different from those prevailing for overseas entities, the risk profile of overseas entities is likely to differ from those within Australia. Consequently, the returns required are also likely to differ. Hence, when estimating input parameters for the Sharpe-Lintner CAPM we place most reliance on Australian market data whilst using overseas data informatively.

Benchmark gearing

We apply a benchmark efficient level of gearing of 60 per cent, as noted above. This benchmark gearing level is used:

- to weight the allowed return on debt and equity to derive the overall allowed rate of return using the WACC formula
- to re-lever asset betas for the purposes of comparing the levels of systematic risk across businesses which is relevant for the equity beta estimate.

We adopt a benchmark credit rating which is BBB+ or its equivalent for the purposes of estimating the return on debt. To derive this benchmark rating and the gearing ratio, we reviewed a sample of regulated network providers. Amongst a number of other factors, a regulated service provider's actual gearing levels have a direct relationship to its credit ratings. Hence, our findings on the benchmark gearing ratio of 60 per cent and the benchmark credit rating are interrelated given we derive the underlying evidence from a sample of regulated network service providers.[119]

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118 AER, *Better regulation: Rate of return guideline explanatory statement,* December 2013, ch.3.3

119 AER, *Better Regulation: Rate of return guideline explanatory statement*, December 2013, ch.8.34 and appendix F.

Term of the rate of return

We adopt a 10 year term for our overall rate of return.[120] This results in the following economic interdependencies that impact on the implementation of our return on equity and debt estimation methods:

- the risk free rate used for estimating the return on equity is a 10 year forward looking rate
- the market risk premium (MRP) estimate is for a 10 year forward looking period
- we adopt a 10 year debt term for estimating the return on debt.

3.3.7 Consideration of relevant material

In making regulatory decisions, we are to have regard to information provided in regulatory proposals and submissions.[121] We also consider a broad range of material more generally. This is consistent with the rate of return framework that requires we have regard to a wide range of relevant estimation methods, financial models, market data and other evidence.[122] This is also consistent with statements of the AEMC that consider the rules are intended to permit us to take account of a broad range of information to improve the required rate of return estimate.[123]

In the following sections, we summarise how we have considered a large range of material. This includes, but is not limited to:

- service provider proposals
- expert reports
- stakeholder submissions
- recent Tribunal decisions.

Service providers' proposals

The revised regulatory proposals that we are currently considering (including JEN's revised proposal) have challenged most aspects of the Guideline approach (and methods) to estimating the return on equity and debt. We have reviewed the material submitted since our preliminary decisions, and considered the reasons for the proposed departures from the Guideline. We have taken into account stakeholder

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120 See AER, *Better regulation: Rate of return guideline explanatory statement,* December 2013, ch.4.3.4.

121 NER, cl. 6.11.1(b); NER, cl. 6A.13.1(a1). NGR, cl. 59(1), 62(1) states we are to consider submissions before making our regulatory decisions NGR, cl, 64(2) states that our proposal for an access arrangement or revisions is to be formulated with regard to the service providers proposal (among other things).

122 NGR, r. 87(5)(a) and NER clause 6.5.2(e).

123 AEMC, *Rule determination: National electricity amendment (Economic regulation of network service providers) Rule 2012: National gas amendment (Price and revenue regulation of gas services) Rule 2012*, 29 November 2012, p. 67 (AEMC, *Final rule change determination*, November 2012).

submissions on our preliminary decisions, and on service providers' revised and initial proposals.

In doing so, we have undertaken two interdependent tasks as required by the rules:

- consider whether the proposed departures would better achieve the ARORO such that we should depart from the Guideline
- determine a rate of return that we are satisfied achieves the ARORO.

The service providers that submitted regulatory proposals and revised regulatory proposals that we are currently considering have submitted a large volume of material in support of their proposals.[124] We reviewed this material to identify what is new. Where service providers submitted new material, we reviewed this and considered its implications in determining the return that meets the ARORO and whether we should depart from the Guideline. We also referred this material to our consultants for their consideration prior to making our preliminary and final decisions. Our considerations are throughout this rate of return attachment and relevant appendices.

While we consider each regulatory proposal afresh, much of the material currently before us is the same material we considered in making our decisions in 2015.[125] For this final decision, unless stated otherwise, we adopt the rate of return analysis and reasoning as set out in our most recent final decisions in October 2015.[126]

Our October 2015 final decisions comprehensively set out our allowed rate of return analysis and reasoning.[127] During these reset processes, we also considered a number of other regulatory resets.[128] TasNetworks' original proposal did not propose any departures from the Guideline. TasNetworks and Directlink adopted our return on equity draft decisions. At that time, the other service providers proposed varying reasons, material and propositions to justify their proposed departures from the Guideline and their proposals to not accept our draft decisions. Further, the service providers submitted a large volume of material in support of their proposals. Much of this material was not new to us and we had considered it when developing the Guideline and again in making our decisions. Nonetheless, we comprehensively

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124 The service providers are: ActewAGL Gas Distribution, APTNT, Australian Gas Networks, AusNet Services distribution, AusNet Services Transmission, CitiPower, Jemena Electricity Networks, Powercor, Powerlink.

125 For material on an April 2015 decision (TransGrid), see https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/transgrid-determination-2014-18. For material on an October 2015 decision (Energex), see https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/energex-determination-2015-2020/final-decision. For similar material, see our decisions in 2015 on ActewAGL distribution, Ausgrid, Directlink, Endeavour Energy, Ergon Energy, Essential Energy, JGN, SAPN and TasNetworks.

126 That is, AER, *Final decision: SA Power Networks determination 2015 -16 to 2019–20, Attachment 3—Rate of return*, October 2015. Also see our decisions for Ergon Energy and Energex.

127 That is, AER, *Final decision: SA Power Networks determination 2015 -16 to 2019–20, Attachment 3—Rate of return*, October 2015. Also see our decisions for Ergon Energy and Energex.

128 For example, revised proposals from Ausgrid, Endeavour Energy, Essential Energy, TasNetworks (adopted the Guideline), ActewAGL, TransGrid, Directlink and Jemena Gas Networks (NSW).

reviewed all of this material. We also referred this material to our consultants for their consideration prior to publishing decisions in 2015.[129]

Expert reports

We commissioned expert advice from the following finance experts to assist us in making our decisions:

- Professor Michael McKenzie, University of Liverpool.[130]
- Professor Stephen Satchell, Trinity College, Cambridge University[131]
- Associate professor Graham Partington, University of Sydney.[132]
- Associate professor John Handley, University of Melbourne.[133]
- Dr Martin Lally, Capital Financial Consultants.[134]
- Chairmont, a financial market practitioner.[135]

We received advice from Professor Olan Henry, University of Liverpool, on estimating the equity beta. We commissioned this during the Guideline development process and published the final report in April 2014.[136] We also received advice on return on debt estimation from the ACCC Regulatory Economic Unit (REU).[137] Additionally, we sought and received a substantial amount of expert advice during the Guideline development

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[129] For material on an April 2015 decision (TransGrid), see https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/transgrid-determination-2014-18. For material on an October 2015 decision (Energex), see https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/energex-determination-2015-2020/final-decision. For similar material, see our decisions in 2015 on ActewAGL distribution, Ausgrid, Directlink, Endeavour Energy, Ergon Energy, Essential Energy, JGN, SAPN and TasNetworks.

[130] McKenzie, M., Partington, G., *Report to the AER Part A: Return on Equity*, October 2014.

[131] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016; Partington, G., Satchell, S., *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016; Partington and Satchell, *Report to the AER: Analysis of criticisms of 2015 determination,* October 2015; Partington, G., Satchell, S., *Report to the AER: Return on equity and comment on submissions in relation to JGN*, May 2015.

[132] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016; Partington, G., Satchell, S., *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016; Partington, G., Satchell, S., *Report to the AER: Analysis of criticisms of 2015 determination,* October 2015; Partington, G., Satchell, S., *Report to the AER: Return on equity and comment on submissions in relation to JGN*, May 2015; Partington, G., *Report to the AER: Return on equity (Updated)*, April 2015; McKenzie, M., Partington, G., *Report to the AER Part A: Return on Equity*, October 2014.

[133] Handley, J., Further a*dvice on return on equity, April* 2015; Handley, J., *Advice on return on equity, Report prepared for the AER*, 16 October 2014; Handley, J., *Report prepared for the Australian Energy Regulator: Advice on the value of imputation credits*, 29 September 2014.

[134] Lally, M., *Gamma and the ACT decision*, May 2016; Lally, M., *Review of submissions on implementation issues for the cost of debt*, October 2015; Lally, M., *Review of submissions on transition issues for the cost of debt*, October 2015; Lally, M., *Review of submissions on the cost of debt*, April 2015; Lally, M., *Transitional arrangements for the cost of debt*, November 2014; Lally, M., *Implementation issues with the cost of debt*, November 2014.

[135] Chairmont, *Financial practices under regulation: past and transitional*, October 2015; Chairmont, *Cost of debt: Transitional analysis*, April 2015.

[136] Olan Henry, *Estimating β: An update*, April 2014.

[137] REU, *Return on debt estimation: a review of the alternative third party data series*, August 2014.

process including from the REU. These reports have also assisted us in making our decision.

Stakeholder submissions

Stakeholders made submissions specific to JEN which we have considered.[138] In making this decision, we have also considered material submitted for the recent decisions published in April, June and October 2015. Overall, in making these recent decisions we received a large number of submissions on the original proposals, preliminary decisions and revised rate of return proposals.[139] Most of these submissions, including those on JEN's revised proposal and our preliminary decision, had commentary relating to the rate of return.

We received detailed input on the rate of return from the Consumer Challenge Panel (CCP). This included input form the CCP Sub Panel 3 (CCP3) on the current Victorian electricity distribution processes.[140] Also see advice from CCP Sub Panel 8 (CCP8) on the current gas access arrangement processes.[141]

Consideration of recent Tribunal decisions

The Tribunal recently reviewed and upheld several aspects of our approach to estimating the rate of return. These included:[142]

- our approach to estimating the return on equity by applying the Guideline approach referred to as the foundation model approach
- our approach to specifying the benchmark credit rating at BBB+ rather than BBB as preferred by some of the service providers
- our approach to estimating the allowed return on debt using a simple average of the RBA and Bloomberg data series, rather than the RBA data series alone as preferred by some of the service providers.

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138 For a list of submissions on JEN's initial regulatory proposal see AER, *Preliminary decision: JEN distribution determination 2016 to 2020: Overview*, October 2015, pp. 60–61. For a list of submissions on JEN' revised regulatory proposal and our preliminary decision, see AER, *Final Decision: JEN distribution determination 2016 to 2020: Overview*, May 2016, Attachment A.

139 Recent regulatory determinations are for the following service providers: ActewAGL, Ausgrid, Endeavour Energy, Energex, Ergon Energy, Essential Energy, Directlink, Jemena Gas Networks, SA Power Networks, TasNetworks and TransGrid.

140 CCP3, *Submission to the AER: An Overview - Response to AER Preliminary Decisions and revised proposals*, February 2016; CCP3, *Submission to the AER: Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for a revenue reset for the 2016–2020 regulatory period*, February 2016.

141 CCP8, *Advice to AER: Draft Decision and ActewAGL Distribution's Revised Access Arrangement 2016–2021 Proposal*, March 2016, p. 2; CCP8, *Advice to AER: Draft Decision and AGN's (SA) Revised Access Arrangement 2016-2021 Proposal*, March 2016, p. 2.

142 Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, paras 813, 993, 983; Australian Competition Tribunal, *Application by Jemena Gas Networks (NSW) Ltd [2016] ACompT 5*, 3 March 2016, paras 47, 49, 95.

We have maintained our approach to estimating these components of the allowed rate of return in this decision.

The Tribunal also recently reviewed our approach to applying a full transition from an on-the-day to a trailing average allowed return on debt for certain electricity distribution businesses operating in NSW and the ACT, and a gas distribution business in NSW. The Tribunal found error in our approach and remitted this matter back to us to make a decision on introducing the trailing average approach in accordance with several reasons outlined in its decision.[143] On 24 March 2016, we applied to the Federal Court for judicial review of this aspect of the Tribunal's decision. In particular, we have applied for review on:

- the Tribunal's finding that a benchmark efficient entity referred to in the NER 6.5.2(c) would be an unregulated entity [144]
- the Tribunal's rejection of a single benchmark efficient entity for those service providers
- the Tribunal's approach to the interpretation of cl. 6.5.2(k)(4) of the NER.[145]

3.4 Reasons for final decision

Our allowed rate of return is a weighted average of the return on equity and debt determined on a nominal vanilla basis (that is, a vanilla WACC). It has been estimated consistently with the estimation of the value of imputation credits.[146]

In deriving the WACC, and the estimated efficient debt and equity financing costs, we have applied the benchmark efficient entity gearing ratio of 0.6 (debt):0.4 (equity) that we proposed in the Guideline. We have no reason to depart from this gearing ratio.[147]

In making this decision we have considered issues that have been raised by JEN as well as different service providers and stakeholders in our recently published regulatory determinations. While we have addressed matters specifically raised by JEN and/or stakeholders in this decision process, much of our analysis and reasoning also addresses maters raised by service providers (and stakeholders) in their regulatory determination processes. All of this material informs our view on JEN's revised proposal and also underpins our decision on the return on equity that contributes to the achievement of the ARORO.[148] That is, a return commensurate with the efficient

143 Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, para 1,227. The Tribunal's reasons are set out in paras 870 to 940. Also see Australian Competition Tribunal, *Application by Jemena Gas Networks (NSW) Ltd [2016] ACompT 5*, 3 March 2016, paras 80–83.

144 NGR, cl. 87(3); NER, cl. 6A.6.2(c) include similar provisions.

145 The transmission and gas rules mirror this provision in NER, cl. 6A.6.2(k)(4); NGR, cl. 87(11)(d).

146 NER, cl. 6.5.2(d); NGR, r. 87(4).

147 All the NSPs whose original and revised proposals we are currently assessing have proposed a gearing ratio consistent with the Guideline.

148 NER, cl. 6.5.2(f–g); NER, cl. 6A.6.2(f–g); NGR, r. 87(2).

financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to JEN in respect of the provision of standard control services.[149]

We discuss our reasons for the return on equity and return on debt under the separate subheadings, 3.4.1 and 3.4.2, respectively. Subsections 3.4.3 and 3.4.4 set out the gearing ratio and our expected inflation rate for the 2016–20 regulatory control period.

3.4.1 Return on equity

Our return on equity estimate is 7.5 per cent. We consider that 7.5 per cent is the best estimate to combine with a return on debt estimate to form an overall allowed rate of return that achieves the ARORO. We also consider that 7.5 per cent is consistent with the prevailing conditions in the market for equity funds.

We hold these views because:

- We derive our estimate using the Sharpe–Lintner CAPM, which:
  - transparently presents the key risk and reward trade-off[150] that is at the heart of our task[151]
  - is widely and consistently used for estimating the expected return on equity by financial market practitioners, academics, and other regulators[152]
  - has well-accepted and unbiased methods for estimating its parameters, and these parameters can be estimated with tolerable accuracy, unlike the alternative models proposed by service providers.
- We have regard to the prevailing market conditions for equity funds. We use the dividend growth model and conditioning variables to inform our estimate of the market risk premium. We use other relevant sources of information to cross-check the foundation model estimate. The triangulation of estimates from relevant market participants broadly supports our foundation model estimate of the return on equity. (see Appendix D and E for more discussions).
- Our estimate is supported by comparison to estimates from the Wright specification of the CAPM, broker reports, valuation reports, and other regulators' decisions.
- The consistency over time of our Sharpe-Lintner CAPM estimation approach (reflective of a risk premium above a prevailing risk free rate) has been supportive of investment. While taking into account the downward trends in both our risk

149 NER, cl. 6.5.2(c); NGR, r. 87(3).

150 That is, systematic risk priced via expected returns on equity.

151 As set out in NER cl.6.5.2(c); NER cl. 6A.6.2(c); NGR r. 87(3).

152 See AER, *Explanatory statement to the rate of return guideline (appendices)*, 17 December 2013, pp. 12–13.

premium and the risk free rate,[153] service providers have continued to invest in their networks and propose to continue to grow their asset bases.[154]

- Our return on equity estimate is approximately 188 basis points above the prevailing yield-to-maturity on BBB-rated debt with a 10 year term-to-maturity. For a benchmark efficient entity with a similar degree of risk as CitiPower, we would not expect the return on equity to be a long way above the prevailing return on debt.[155]
- We have come to this estimate following the application of our foundation model approach, which:
  - involves consideration of all relevant material submitted to us, and the role for each piece of material that would best achieve the ARORO; and
  - was developed through extensive consultation during our Guideline review process.

The Sharpe-Lintner CAPM provides that the return on equity can be calculated as the risk-free return and a premium for risk above the risk-free rate, with the risk premium calculated as the product of the market risk premium and equity beta.[156] Our Sharpe-Lintner CAPM estimate is based on:

- a prevailing risk free rate estimate of 2.93 per cent
- a market risk premium estimate of 6.5 per cent, and
- an equity beta estimate of 0.7.[157]

Our derivation of these parameter estimates is outlined in the subsections below.

The following aspects of our return on equity estimate have broad agreement from both service providers and consumer groups:

- The Sharpe-Lintner CAPM, at least in combination with other relevant material, is valuable for estimating return on equity
- The risk free rate should be estimated as the yield, averaged over a 20 business day averaging period, on Australian government securities with a ten-year term-to-maturity.[158]

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153 Our regulatory determinations and rate of return guidelines since 2009 have set an equity risk premium ranging from 5.2 per cent to 4.55 per cent [AER, *Final Decision*, *Electricity transmission and distribution network service providers, Review of the weighted average cost of capital (WACC) parameters*, 1 May 2009].

154 Between 2007–08 and 2013–14, the regulated transmission and distribution service providers across the national electricity market have invested in the order of more than $44 billion in capital expenditure. The annual capital expenditure has remained largely stable at around $6 billion per year.

155 Due to the regulatory regime and the businesses' monopoly positions shielding them from systematic risk; as well as the measured prevailing debt yields likely overstating the expected return on debt due to default risk. For more information, see section pages 96 to 99 of Attachment 3 to our preliminary decision for JEN.

156 For more information on the Sharpe-Lintner CAPM, see section B.1.

157 Calculated as: 7.5% = 2.93% + 0.7 * 6.5%. For more information on the Sharpe-Lintner CAPM, see section B.1.

158 Appendix L sets out the averaging period used in this decision.

- Market risk premium estimates should be informed by historical stock returns and (to some extent) dividend growth model estimates.
- Equity beta estimates should be informed by regression estimates of the equity beta of relevant Australian and, to some extent, international energy network businesses.
- The Wright specification of the CAPM, and return on equity estimates from broker and valuation reports, are relevant material that can inform return on equity estimation.

There was also broad agreement from consumer groups on the application of our foundation model approach as set out in our Guideline. In applying our foundation model approach, some consumer groups supported our parameter estimates of 6.5 per cent for market risk premium and 0.7 for equity beta[159] while others submitted that these parameters should be lower.[160]

Origin Energy submitted that we have adopted a balanced and pragmatic approach that provides certain and predictable outcomes for investors and provides a balance between the views of consumer groups and the network businesses.[161] AGL submitted support for our Rate of Return Guideline as an equitable balance between the interests of the distribution networks and energy consumers.[162] The Energy Users Coalition of Victoria (EUCV) noted that consumers have accepted the guideline as being equitable and appropriate.[163] The Consumer Challenger Panel (sub-panel 3) (CCP3) noted that the AER should continue to apply the return on equity methodology set out in the

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159 Origin Energy, *Submission on ActewAGL's revised access arrangement for 2016–21*, 4 February 2016, p. 2; Origin Energy, *Submission on AGN's revised access arrangement for 2016–21*, February 2016; Victorian Government, *Submission on the Victorian electricity distribution network service providers' revised regulatory proposals for 2016–20*, 12 February 2016, p. 1–2; EUCV, *A response to AusNet revenue reset proposal for the 2017–2022 period*, 9 February 2016; AGL, *Submission on the AER's draft decision on AGN's 2016–21 access arrangement*, 4 February 2016, p. 2.

160 ECCSA, *A response to the AER draft decision on AGN's AA2016 revenue reset,* February 2016, p. 32–37; VECUA, *Submission on the AER: AER preliminary 2016–20 revenue determinations for the Victorian DNSPs*, 6 January 2016, p. 2; CCP (panel 5), *Transmission for the generations: Response to proposal by AusNet Services transmission group pty ltd and AER issues paper for AusNet Services transmission revenue review 2017–22*, February 2016, p. 41; CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 25 February 2016, pp. 10, 30–31, 33.

161 Origin Energy, *Submission on ActewAGL's revised access arrangement for 2016–21*, 4 February 2016, p. 3; Origin Energy, *Submission on AGN's revised access arrangement for 2016–21*, February 2016; Origin Energy, *Submission on the AER's preliminary decisions on the Victorian distribution network service providers for 2016–20*, 6 January 2016, p. 3; Origin Energy, *Submission on the Victorian networks' revised proposals (for 2016–21)*, 4 February 2016.

162 AGL, *Submission on the AER's draft decision on AGN's 2016–21 access arrangement*, 4 February 2016, p. 2.

163 EUCV, *A response to AusNet revenue reset proposal for the 2017–2022 period*, 9 February 2016.

Guideline because the regulated businesses have not provided sufficient reasons to move away from it.[164]

While there was general support for our parameter estimates, consumer groups also submitted that these parameter estimates reflect a 'cumulative conservatism' that may result in over-estimating the return on equity. [165] However, in supporting our parameter estimates, consumer groups submitted that they valued the predictability and transparency resulting from the application of our Guideline and foundation model approach.[166]

Service providers disagreed with us on the relative merits of relevant material, as well as some of our methodological choices, submitting that:

- The Black CAPM, Fama-French model, and dividend growth model can reliably inform an overall return on equity estimate and compensate for biases existing in the Sharpe-Lintner CAPM.
- In estimating the market risk premium we should afford greater weight to estimates from our dividend growth model, from valuation reports, and from the Wright specification of the CAPM; while affording less weight to estimates from surveys and other regulators' decisions. Further, we have incorrectly utilised this evidence.
- The regression evidence of equity betas for relevant businesses, which should not be restricted to regulated energy businesses, indicates that our equity beta estimate should be greater than 0.7. Further, our conceptual analysis of equity beta relies on an incorrect assessment of risk,[167] and our application of the theory of the Black CAPM should be quantified.
- In comparing our initial return on equity estimate, based on the Sharpe-Lintner CAPM, against a range of other independent material, we have incorrectly adjusted

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[164] CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, February 2016, p. 33.

[165] ECCSA, *A response to the AER draft decision on AGN's AA2016 revenue rese*t, February 2016, p. 36; CCP (panel 3), S*ubmission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory perio*d, February 2016, pp. 10, 29.

[166] CCP (panel 5), *Transmission for the generations: Response to proposal by AusNet Services transmission group pty ltd and AER issues paper for AusNet Services transmission revenue review 2017–22*, February 2016; Origin Energy, *Submission on ActewAGL's revised access arrangement for 2016–21*, 4 February 2016, p. 3; Origin Energy, *Submission on AGN's revised access arrangement for 2016–21*, February 2016; Origin Energy, *Submission on the AER's preliminary decisions on the Victorian distribution network service providers for 2016–20*, 6 January 2016, p. 3; Origin Energy, *Submission on the Victorian networks' revised proposals (for 2016–21*), 4 February 2016; VECUA*, Submission on the AER: AER preliminary 2016–20 revenue determinations for the Victorian DNSPs*, 6 January 2016, pp. 2, 11–12; CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 25 February 2016, pp. 30–31.

[167] Our conceptual analysis is a qualitative exploration of the systematic risk for a benchmark efficient entity relative to the market average firm.

and interpreted evidence from the Wright approach, broker reports, valuation reports, and other regulators' decisions.

- Our foundation model approach follows movements in the risk free rate too closely, resulting in a return that is too low in the current market.

These issues are discussed in turn below. We are not satisfied that any information submitted to us indicates that a departure from the Guideline would contribute to the achievement of the ARORO. In addition to the reasons outlined in the subsections below, we consider the importance placed by all stakeholders on predictability and transparency is important to contribute to the achievement of the ARORO.[168]

Services providers' proposed multi-model approach

Our return on equity estimate of 7.5 per cent is derived from our application of the Sharpe-Lintner CAPM as our foundation model. We consider the Sharpe-Lintner CAPM is the best model for estimating the efficient costs of equity financing because it:

- transparently presents the key risk and reward trade-off[169] that is at the heart of our task[170]
- is widely and consistently used for estimating the expected return on equity by financial market practitioners, academics, and other regulators[171]
- has well-accepted and unbiased methods for estimating its parameters, and these parameters can be estimated with tolerable accuracy, unlike the alternative models proposed by service providers.

Our consultants have also agreed with our use of the Sharpe-Lintner CAPM as the foundation model. Handley stated:[172]

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168 We received many stakeholder submissions supporting our guideline approach including: Origin Energy, *Submission on ActewAGL's revised access arrangement for 2016–21*, 4 February 2016, p. 3; Origin Energy, *Submission on AGN's revised access arrangement for 2016–21*, February 2016; Origin Energy, *Submission on the AER's preliminary decisions on the Victorian distribution network service providers for 2016–20*, 6 January 2016, p. 3; Origin Energy, *Submission on the Victorian networks' revised proposals (for 2016–21*), 4 February 2016; AGL, *Submission on the AER's draft decision on AGN's 2016–21 access arrangement*, 4 February 2016, p. 2; Victorian Government, *Submission on the Victorian electricity distribution network service providers' revised regulatory proposals for 2016–20*, 12 February 2016, p. 1–2; EUCV, *A response to AusNet revenue reset proposal for the 2017–2022 period*, 9 February 2016; CCP (panel 5), *Transmission for the generations: Response to proposal by AusNet Services transmission group pty ltd and AER issues paper for AusNet Services transmission revenue review 2017–22*, February 2016; CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 25 February 2016, p. 30; CCP (panel 8), *Advice to AER from Consumer Challenger Panel sub-panel 8 regarding the AER Draft Decision and Australian Gas Networks' (SA) Revised Access Arrangement 2016–21 Proposal*, 31 March 2016, p. 2.

169 That is, systematic risk priced via expected returns on equity.

170 As set out in NER cl.6; NER cl. 6A; NGR r.87.

171 See AER, *Explanatory statement to the rate of return guideline (appendices)*, 17 December 2013, pp. 12–13.

172 Handley, *Advice on the return on equity*, 16 October 2014, p. 4.

> [t]he AER's choice of the Sharpe-CAPM as foundation model is entirely appropriate and reasonable for this purpose. The Sharpe-CAPM is the standard (equilibrium) asset pricing model. It has a long established and well understood theoretical foundation and is a transparent representation of one of the most fundamental paradigms of finance - the risk-return trade off.

McKenzie and Partington indicated with respect to the Sharpe–Lintner CAPM:[173]

> With regard to the CAPM, its efficacy comes from the test of time. This model has been around for in excess of half a century and has become the standard workhorse model of modern finance both in theory and practice. The CAPMs place as the foundation model is justifiable in terms of its simple theoretical underpinnings and relative ease of application. The competing alternatives, which build upon the CAPM, serve to add a level of complexity to the analysis.

Since publishing our Guideline service providers have submitted that the use of additional models for estimating the return on equity, and various methods for combining the models, would result in an improved estimate. The additional models submitted by service providers are the Black CAPM, Fama-French model, the dividend growth model, and the historical and Wright specifications to the Sharpe-Lintner CAPM.

We consider the relative merits of this material in detail in section B of this attachment. In summary, we consider that the models other than the Sharpe-Lintner CAPM are too unreliable and at risk of potential bias to be relied upon. Given the limitations of the other equity models proposed by the service providers, we consider that:

- These models should not form part of our foundation model approach, either as the sole model or as part of a multi-model approach.
- The Wright approach, the dividend growth model, and the theory underpinning the Black CAPM may provide some (albeit limited) insights. This material has been used to inform our overall return on equity estimate (Wright) or the estimation of Sharpe-Lintner CAPM parameters (Black CAPM and dividend growth model).[174]
- The Fama-French model and historical specification of the Sharpe-Lintner CAPM should not be used to inform our return on equity estimate in any capacity.

Consumers and other stakeholders generally supported our use of the Sharp-Lintner CAPM and our foundation model approach.[175]

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[173] McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 9. This position was also supported by Partington, *Report to the AER: Return on equity (updated)*, April 2015, p. 29; Partington and Satchell, *Report to the AER: Return of equity and comment on submissions in relation to JGN*, May 2015, p. 7; and Partington and Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, pp. 17, 21.

[174] We note that our specification of these models (particularly the dividend growth model) may differ from that proposed by the service providers.

[175] Origin Energy, *Submission on ActewAGL's revised access arrangement for 2016–21*, 4 February 2016, p. 2; Origin Energy, *Submission on AGN's revised access arrangement for 2016–21*, February 2016; Victorian Government, *Submission on the Victorian electricity distribution network service providers' revised regulatory proposals for*

Service providers generally expressed preference towards estimating the return on equity by combining estimates from the Sharpe-Lintner CAPM, Black CAPM, Fama-French model, and dividend growth model (the multi model approach).[176]

Service providers also expressed a second preference for an alternative implementation of the Sharpe-Lintner CAPM, in which the equity beta is increased to account for the low-beta and book-to-market biases using outputs from the Black CAPM and the Fama-French model respectively.[177] However, we consider that Frontier's Sharpe-Lintner CAPM appears to be effectively another multi-model approach, applying a 75 per cent weight to the return on equity estimate from its Black CAPM and 25 per cent weight to its Fama-French model estimate.[178]

The service providers submit that either approach better reflects efficient costs of equity financing, and that our foundation model approach results in an estimate of the required return on equity that is too low. [179]

We note that service providers have raised similar arguments in previous submissions and revenue determinations. [180] They effectively revolve around the following claims:

2016–20, 12 February 2016, p. 1–2; EUCV, *A response to AusNet revenue reset proposal for the 2017–2022 period*, 9 February 2016; AGL, *Submission on the AER's draft decision on AGN's 2016–21 access arrangement*, 4 February 2016, p. 2

176 There are some variations between the service providers on weighting the estimates from the different models, but the general approach and rationale remain broadly consistent.

177 CitiPower, *Revised Regulatory Proposal 2016–2020*, January 2016, p. 284; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, p. 278; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, p. 54; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 77–78; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 44–45; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 43–44; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 38–39.

178 Frontier, *The required return on equity under a foundation model approach*, January 2016, p. 55.

179 See, for example, CitiPower, *Regulatory proposal 2016–2020*, April 2015, p. 198–204 & 224; CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 267, 284–286, 324–326; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 261, 278–280, 318–320; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 52–72, 94–105; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 38–40, 77–78; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 81–82; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 43–45; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 38–46, 50–52; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 56, 69–73.

180 See, for example, CitiPower, *Regulatory proposal 2016–2020*, April 2015, p. 198–204 & 224; Powercor, *Regulatory proposal 2016–2020,* April 2015, pp.206–210, 218, 227, 232–234; ActewAGL, *Access Arrangement Information for the 2016-21 ACT, Queanbeyan and Palerang Access Arrangement, Appendix 8.02: Return on*

- That empirical evidence shows that the Sharpe-Lintner CAPM is downwardly biased and that there are alternative models available that can reliably address these biases,[181] specifically:
  - the Black CAPM can address low beta bias in the Sharpe-Lintner CAPM (a tendency for the Sharpe-Lintner CAPM to estimate a downwardly-biased return on equity for stocks with an equity beta less than one), and
  - the Fama-French model can address book-to-market bias in the Sharpe-Lintner CAPM (a tendency for the Sharpe-Lintner CAPM to estimate a downwardly-biased return on equity for stocks with low book-to-market ratios)
- The dividend growth model more accurately and reliably reflects investors' prevailing required return on equity, and provides a better consideration of prevailing market conditions, than the Sharpe-Lintner CAPM.

In their revised proposals, services providers provided new expert reports from Frontier and HoustonKemp to further support their views.[182]

We are not satisfied that the service providers' proposed application of other equity models[183] will result in a return on equity that is commensurate with efficient financing costs (given the risk of JEN's regulated services).[184] We consider there is

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equity-detailed proposal, June 2015, pp. 1–5, 19–49; United Energy, *2016 to 2020 regulatory proposal*, April 2015, pp. 113–123; AGN, *2016/17 to 2020/21 Access Arrangement information: Attachment 10.1 Rate of return*, July 2015, pp. 8–27, 39–42; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal: Attachment 9-2 Rate of return proposal*, 30 April 2015, pp. 19–20, 20–58; AusNet Services, *Regulatory proposal 2016–20*, 30 April 2015, pp. 280–314; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, pp. 112–131.

181 CitiPower, *Revised Regulatory Proposal 2016–2020*, January 2016, p. 287; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, p. 281; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 54–65; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 40–46; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 47–49; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 46–47; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 41–46; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 69–73.

182 Frontier Economics, The *required return on equity under a foundation model approach – Report prepared for Jemena Electricity Networks, ACTEWAGL Distribution, AusNet Services, Australian Gas Networks, CitiPower, Powercor and United Energy*, January 2016; HoustonKemp, *The Cost of Equity: Response to the AER's draft decisions for the Victorian Electricity Distributors, ActewAGL Distributors and Australian Gas Networks*, January 2016; Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016.

183 For both the construction of individual models, and the quantitative and/or qualitative methods to give weight to the models.

184 For example, Partington noted that any return on equity estimate could be obtained from SFG's DGM construction through judicious choice of input assumptions [Partington, *Report to the AER: Return on equity (updated)*, April 2015, p. 54].

overwhelming evidence that the Sharpe-Lintner CAPM is the current standard-bearer for estimating expected equity returns.

Our consultant, Partington and Satchell, noted that the 'SLCAPM remains the premier model used to estimate the cost of capital in practice, by both industry and regulators' and has wide agreement as 'a model of equilibrium expected returns'.[185]

Partington and Satchell also noted that the parsimony and observability of the Sharpe–Lintner CAPM 'reduces opportunities for cherry picking and also provides the opportunity for a relatively transparent implementation'.[186]

We do not agree that our application of the Sharpe-Lintner CAPM, given our choice of appropriate parameters, is downwardly biased for either low beta bias or book-to-market bias. We do not consider that reliable estimates of the return on equity can be derived from the Black CAPM, Fama-French model, or dividend growth model.

We have considered and responded to these issues and the associated supporting material in our previous decisions.[187] That reasoning remains valid here. We respond to each of the issues raised in Table 3-4.

We also note that our consideration of the relative merits of the Sharpe-Lintner CAPM, Black CAPM, Fama-French model, and dividend growth model are supported by the widespread use of the Sharpe-Lintner CAPM over the other models by market participants including brokers, valuers, and other regulators.[188] Further, our application of the Sharpe-Lintner CAPM in our foundation model approach and our return on equity estimate are supported by a range of relevant material including market-based evidence (see 'The overall return on equity' below).

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185 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 47.

186 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 9.

187 For example, see AER, *Preliminary decision: CitPower Determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 257–323;. AER, *Powercor Preliminary Decision - Attachment 3: Rate of Return*, October 2015, pp. 257–323; AER, *Draft decision ActewAGL distribution determination 2016 to 2021: Attachment 3 – Rate of return*, November 2015, p. 265–331; AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 253–320; AER, *Draft decision Australian Gas Networks access arrangement 2016 to 2021–Attachment 3: rate of return*, November 2015, pp. 267–333; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 231–327; AER, *Preliminary decision AusNet Services determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 260–326; AER, *Draft decision Amadeus Gas Pipeline access arrangement 2016 to 2021: Attachment 3–Rate of return*, November 2015, pp. 264–330.

188 See Brealey, Myers, Partington and Robinson, *Principles of corporate finance*, McGraw Hill Australia, 2007, p. 216; Stephan Schaeffler and Christoph Weber, 'The Cost of Equity of Network Operators – Empirical Evidence and Regulatory Practice', *Competition and Regulation in Network Industries*, 14(4), 2013, p. 386; McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 9–10; AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 13–14.

Table 3-4 Issues raised about our use of equity models

Issue	Summary of our response
A multi-model approach results in a more reliable estimate of the return on equity than a single-model approach, regardless of the models used.[189] The AER must run the Black CAPM, Fama-French model and dividend growth model in order to have regard to them.[190]	We are not (in principle) averse to a multi-model approach where the models are equally valid for the intended objective.[191] However, we are not satisfied that is the case. Having regard to relevant material must include having regard to the relative merits of the material. Partington has emphasised the dangers of simply combining information from different models. He advised that:[192] *It is by no means assured that more information will result in a better estimate if that information is of poor quality or is downright misleading…it cannot be taken for granted that a number is meaningful without fully understanding the context in which it is estimated.* Partington and Satchell also cautioned against 'giving these models significant weight in a regulatory setting' due to their weaknesses such as being prone to manipulation and lack of wide-spread use in practice.[193] For the reasons outlined in the remainder of this table and in section B, we do not consider that quantitative application of the Black CAPM, Fama-French model or the dividend growth model (for estimating return on equity) would be beneficial. Neither do we consider that it is necessary to run the models to have regard to them.[194]

[189] CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 292–298, 325–326 ; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 286–292, 319–320; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 53–54, 64–72, 104–105; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 38–46, 77–78; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 44–52, 81–82; ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 43– 57, 83–84; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp.38–46; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, pp. 128–131.

[190] CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 292–298; ; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 286–292; ; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 64–72; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 38, 52; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 47–52, 73–74; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 46–51, 51–57 ; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 44–52; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 73; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, pp. 128–131; Frontier Economics, *The required return on equity under a foundation model approach – Report prepared for Jemena Electricity Networks, ACTEWAGL Distribution, AusNet Services, Australian Gas Networks, CitiPower, Powercor and United Energy*, January 2016, p. 21.

[191] As indicated by our approach to estimating the return on debt using a simple average of the RBA and Bloomberg yield to maturity estimates extrapolated out to ten years.

[192] Partington, *Report to the AER: Return on equity (updated),* April 2015, p. 14.

[193] Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 33, 40.

[194] The latter point was supported by the Australian Competition Tribunal ([2016] ACT 1 at 210). See Appendix A for more detail.

Use of the Black CAPM can address the Sharpe-Lintner CAPM's limitation of having low beta bias.[195]	We consider there may be merit in the theory underpinning the Black CAPM. We recognise that the Black CAPM theory involves different underpinning assumptions to the Sharpe-Lintner CAPM that result in a higher return on equity than the Sharpe-Lintner CAPM when equity beta is less than one. We also recognise that Black CAPM theory may provide one possible explanation for the performance of the Sharpe-Lintner CAPM in empirical literature, although there are competing alternative explanations, and we note that the assumptions underpinning the Black CAPM appear no more realistic than those of the Sharpe-Lintner CAPM. It is important to note that all models with simplifying assumptions will likely be affected by market imperfections when they are applied in a practical setting. However, we consider that there are no generally accepted methods for estimating the Black CAPM's parameters, resulting in it being sensitive to input assumptions and creating potential for biased results. We also note that there appears no widespread use of the Black CAPM by market practitioners. These views are supported by Partington and Satchell who reiterate concerns with implementing the Black CAPM.[196] Partington and Satchell noted that the "low beta bias" is a 'tendency for low beta stocks to overperform and high beta stocks to underperform relative to the CAPM… this does not necessarily imply anything other than that the stocks have outperformed or underperformed.[197] For these reasons, we consider that the accuracy and reliability of our return on equity estimate is not improved by estimating the Black CAPM. However, we consider that the theory of the Black CAPM may be used to inform our return on equity estimate. As the implications of the theory of the Black CAPM are relative to the size of our estimated equity beta, we consider it is prudent to have regard to this material in our consideration of equity beta. More detail on our consideration of the Black CAPM is in section B.2.
We have not justified how the selection of input parameters adequately corrects for biased estimates from the Sharpe-Lintner CAPM.[198]	We do not use the theory underlying the Black CAPM to apply a specific uplift to the equity beta. We do not accept that our use of the theory underlying the Black CAPM implies that we consider the Sharpe-Lintner CAPM produces biased return on equity estimates. For more detail see sections D.4, D.5.3, and A.2 of Attachment 3 to JEN 's preliminary decision.

195 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 286–298; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 280–292; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 64–72; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp.40–46; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. pp. 47–52, 73–74; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 46–51; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 41–46; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, p. 70, 73; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, p. 115–120.

196 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp. 34–37 & 39–45.

197 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 43.

198 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, p. 290; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, p. 284; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp.62–64; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 45–46, 51; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 49–52; JEN (Vic), *2016–20*

Valuers uplift their return on equity estimates to a larger extent for businesses with a relatively low equity beta.[199] Broker reports apply a version of the Black CAPM in practice.[200]	We consider that there is not enough data in Incenta's analysis for accurate inferences to be drawn. The results shown in Figure 4.2 of Incenta's report appear highly sensitive to one data point, and are based on valuation reports from only one firm. None of the valuation reports dated between 10 April 2013 and 28 February 2015 explicitly mentioned low-beta bias or the Black CAPM as a reason for an uplift (or at all in any context). There does not appear to be a strong correlation (in any direction) between the uplifts in these reports and the size of the equity beta estimate. At least one broker has recently stated that it had previously used a static valuation methodology, hence any difference between the broker's risk free rate estimate and the yield on government bonds did not necessarily reflect an intentional uplift. For more details, see section E.7 of Attachment 3 to our preliminary decision for JEN.
Use of the Fama-French model can address the Sharpe-Lintner CAPM's limitation of having book-to-market bias.[201]	We are not convinced that the Sharpe-Lintner CAPM is downwardly biased for stocks with a high book-to-market ratio. We are concerned that the Fama-French model lacks well-accepted theoretical foundations, and as a consequence it is not clear that the size and value factors in the model reflect ex ante priced risk factors. This uncertainty is further compounded by the numerous specifications of the Fama-French model that produce different estimates of the return on equity. We also consider that the Fama-French model is not suitable for estimating the required return on equity due to concerns with its sensitivity to input assumptions, complexity, and potential for bias given there are no generally accepted methods for estimating its parameters. We also note that there appears no widespread use of the model by market practitioners. More detail on our consideration of the Fama-French model is in section B.3. Partington and Satchell reiterated that the Fama-French model lack theoretical foundation and is 'still to [gain acceptance] in the world of practice', 'being increasingly questioned'.[202] They also noted that this model can be prone to manipulation.
The Black CAPM and Fama-French model	We acknowledge that the Black CAPM and Fama-French model have been discussed at length in academic literature. However, we have not been presented with evidence that the

Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs, 6 January 2016, pp. 48–51; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 45–46; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, p. 75.

199 Incenta Economic Consulting, *Further update on the required return on equity from independent expert reports*, February 2015, p. 31.

200 Frontier submitted that brokers do not mechanistically apply the Sharpe-Lintner CAPM and that this was evidenced by broker reports tending to estimate a higher risk free rate than the prevailing yield on Australian government securities with a 10-year term to maturity. Frontier Economics, *Key issues in estimating the return on equity for the benchmark efficient entity*, June 2015, p. 58.

201 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, p. 286–298; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 280–292; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 56–72; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 40–50; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 47–49, 54–56; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 46–48, 54–55; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 41–46; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, p. 70–73.

202 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp. 33–34 & 47.

are well-respected and widely used.[203]	models have been widely applied by market practitioners. We examined 78 suitable valuation reports dated between May 2013 and January 2016, and none appeared to estimate the Black CAPM or Fama-French model. There is no indication that the broker reports we have examined estimate these models. There has been some limited use of the Black CAPM by US regulators,[204] but we are not aware of any use of these models by Australian regulators. Partington and Satchell also noted that these models are not widely used in practice.[205]
Use of the dividend growth model to estimate return on equity provides a better incorporation of prevailing market conditions.[206]	We consider that the dividend growth model is very sensitive to input assumptions, particularly the long-term growth rate. We consider there is potential for biased results from dividend growth models as there is no generally accepted method for estimating the long-term growth rate in dividends per share for individual businesses or sectors. We also consider that dividend growth models are likely to be biased in the current market, due to concerns about slow-changing dividend forecasts, bias in analysts' forecasts, and to the extent that there is a term structure for the return on equity. Our consultant, Partington and Satchell, also share long-standing concerns on these issues.[207] Given these concerns, we do not consider that the dividend growth model at this time provides a more reliable indication of prevailing market conditions than the Sharpe-Lintner CAPM. More detail of our consideration of the dividend growth model is in section B.4.
Our foundation model approach prevents other relevant material from being properly considered.[208]	This mischaracterises our approach. As part of our foundation model approach, we assign a role to relevant information (including financial models) based on a consideration of their strengths, weaknesses and suitability for our regulatory task. We identify and assess each of the models on their merits and determine a role for them.

203 CitiPower*, Revised regulatory proposal 2016–2020*, January 2016, p. 296; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, p. 290; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 69–70; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp.50–51; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 48–49, 55–56; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 54–56; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 49–50; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, p. 115–120, 123–128, 128–131.

204 Service providers have previously submitted on the use of the Black CAPM by other regulators. For example, AusNet Services, *Regulatory proposal 2017–22*, 30 October 2015, pp. 258–259.

205 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp.33–34, 40 & 47.

206 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 285, 297–298, 324–326; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 279, 291–292, 318–320; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 54–56, 70–72, 104–106; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 38–40, 51–52, 77–78; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 44–46, 56–58, 81–82; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 42–45; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 39–40; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, pp. 122–123.

207 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp.27–30.

208 CitiPower, Revised regulatory proposal 2016–2020, January 2016, p. 286–326; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 280–320; ActewAGL, *Revised 2016–21 access arrangement proposal*

Estimating the market risk premium

Our estimate of the prevailing market risk premium for this decision is 6.5 per cent. This is a forward-looking estimate of the risk premium—the return above the government bond rate—on the market portfolio required by investors with a ten-year investment horizon.

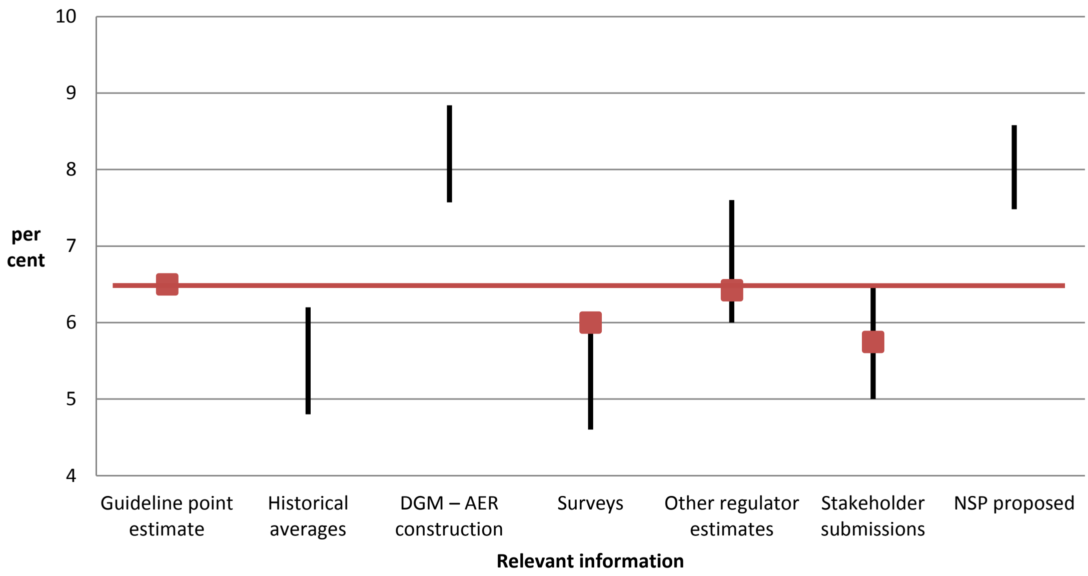
We consider 6.5 per cent to be the best estimate of the market risk premium to contribute to the achievement of the ARORO because:

- it is supported by our consideration of all relevant material submitted to us (following consideration of their relative merits)
- it is corroborated by our cross-checks on the overall return on equity and equity risk premium. This further supports our estimate of the equity risk premium (of which the market risk premium is a component)
- it provides a balanced outcome between submissions by service providers and other stakeholders.

Figure 3-3 shows the market risk premium estimates from the relevant material that has informed our decision. These estimates range from 4.8 per cent to 8.84 per cent.

Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation, January 2016, pp. 56–105; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 40–78; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 46–82; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 46–84; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 38–77; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 68–73.

Figure 3-3 Comparison of estimates of the market risk premium



Source: AER analysis

Note: The average of each state regulator's most recent decision on the market risk premium forms the point estimate (6.4 per cent) for other regulator estimates. The top of this range (7.6 per cent) is from the ERA, while the bottom of this range (6.0 per cent) is from ESCV, ESCOSA, NTUC, TER and the ACCC.[209] The stakeholder submissions range is intended to reflect the views of consumer groups and those who use/engage with the energy network or pipeline, and as such it does not include submissions from services providers. The bottom and top of the stakeholder range comes from the Victorian Energy Consumer and User Alliance (VECUA), Energy Consumer Coalition of South Australia (ECCSA), Origin Energy and Consumer Challenge Panel (CCP).[210] The bottom and top of the service provider proposed range comes from APTNT's (Amadeus gas pipeline) proposal.[211]

We derive our point estimate from within this range by considering the relative merits of all of the relevant material. The application of our approach is set out as follows:

- Historical excess returns provide our baseline estimate and indicates a market risk premium of approximately 5.5 to 6.0 per cent from a range of 4.8 per cent to 6.0 per cent. We consider both geometric and arithmetic averages of historical returns.

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[209] See section C.5 of appendix C—Market Risk Premium for full reference list.

[210] VECUA, *Submission to the AER: AER preliminary 2016-20 revenue determinations for the Victorian DNSPs*, 6 January 2016, p. 17; ECCSA, *A response to the Australian Energy Regulator draft decision on Australian Gas Networks AA2016 revenue reset*, February 2016, p. 36; Origin Energy, *Re: Submission to AER preliminary decision Victorian networks*, 6 January 2016, p. 3; CCP (subpanel 5), *Transmission for the generations: Response to proposal by AusNet Services Transmission Group and AER issues paper*, February 2016, p. 6.

[211] APTNT proposed a market risk premium range of 7.48 to 8.58 per cent. See: APTNT, *Amadeus gas pipeline: revised proposal (AA information)*, January 2016, p. 21.

However, we consider there may be evidence of bias in the geometric averages.[212] Therefore, our range for historical returns is based on arithmetic averages.

- Dividend growth model estimates indicate a market risk premium estimate above this baseline with a range of 7.57 to 8.84 per cent. We consider our dividend growth model is theoretically sound but that there are many limitations in practically implementing this model. We are not confident that the recent increases in estimates of the market risk premium from these models necessarily reflect an increase in the 'true' expected ten-year forward looking market risk premium. We consider our, and other, dividend growth models are likely to produce upward biased estimates in the current market.[213] We also consider our, and other, models may not accurately track changes in the return on equity for the market.[214] See section B.4 for more detail these limitations. For these reasons, we do not consider that the dividend growth model estimates are reliable on their own, but that they do provide some support for a point estimate above the range from historical returns.
- Survey evidence supports a market risk premium around 6.0 to 6.5 per cent. Other regulators' estimates are used as a cross check and indicate a market risk premium estimate of around 6.5 per cent is reasonable. Conditioning variables indicate that there has not been a material change in market conditions since our preliminary decision. See sections F.1, F.4, and E for more detail on this material.

Stakeholder submissions since our preliminary decision (excluding submissions by service providers) have generally supported a market risk premium at or below the 6.5 per cent which we estimated in our preliminary decision. For example:

- The Victorian Energy Consumer and User Alliance (VECUA) continued to recommend a market risk premium of 5.0 per cent, at the bottom of the range determined in the Guideline.[215] VECUA submitted that this appeared to be based on outcome-based considerations regarding the profitability and low risk of service providers and decisions made by other regulators, as well as a view that the AER should exercise its discretion in a more balanced manner.[216]

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[212] For more detail. See: section C.3 of this attachment; AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, p. 83; AER, *Draft decision: SPI Networks access arrangement*, September 2012, Appendix B.2.1.

[213] McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, pp. 26–30; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 46–50, 59; Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, pp. 11–12; Partington and Satchell, *Report to the AER: Return on equity and comment on submissions in relation to JGN*, May 2015, p. 6; Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 43.

[214] McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, pp. 31–32; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 51. Also see Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 43.

[215] VECUA, *Submission to the AER: AER preliminary 2016-20 revenue determinations for the Victorian DNSPs*, 6 January 2016, p. 17.

[216] VECUA, *Submission to the AER: AER preliminary 2016-20 revenue determinations for the Victorian DNSPs*, 6 January 2016.

- The Energy Consumers Coalition of South Australia (ECCSA) commented that the market risk premium estimate in our preliminary decision, as it was set at the higher end of the credible range, added 'considerable conservatism' into the rate of return calculation.[217]
- Origin Energy continued to support our market risk premium estimate of 6.5 per cent as this better reflects the efficient financing costs of a business exposed to the level of risk that applies to an Australian regulated network business.[218]
- In a separate regulatory process, the Consumer Challenge Panel (CCP) advised that we could still set a market risk premium of 6 per cent or below, commenting that a point estimate within our range but lower than those set by us to date would be 'more in the long term interests of consumers while still meeting investors' rights to an adequate return on capital invested'.[219]

Most service providers proposed a market risk premium of 7.8 to 7.9 per cent, based on SFG's[220] weighted average of estimates from the dividend growth model, historical excess returns, the Wright approach, and independent valuation reports. In its revised access arrangement proposal, APTNT appeared to use a market risk premium range of 7.48 to 8.58 per cent based on the Wright approach.[221] However, it also used an estimated market risk premium of 6.1 per cent in its consideration of the Fama-French three-factor model.[222]

We note that some stakeholders submitted that we place too much reliance on some material, that we did not have appropriate regard to information from other relevant sources, or that we made inappropriate methodological choices in our empirical analysis. Table 3-5 sets out stakeholder views on our use of relevant material and our responses. Having considered the overall information and all material before us, at this time we are not satisfied that these submissions indicate a departure from the Guideline would contribute to the achievement of the ARORO and the National Electricity Objective.

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217 ECCSA, *A response to the Australian Energy Regulator draft decision on Australian Gas Networks AA2016 revenue reset*, February 2016, p. 36.

218 Origin Energy, *Re: Submission to AER preliminary decision Victorian networks*, 6 January 2016, p. 3.

219 CCP (subpanel 5), *Transmission for the generations: Response to proposal by AusNet Services Transmission Group and AER issues paper*, February 2016, p. 6.

220 See, for example, SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 8, 84. Service providers typically provided updated estimates based on this SFG approach and updated by Frontier Economics - see: Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, p. 34.

221 APTNT submitted that it did not use the Wright approach but rather "applies the model by making estimates of the expected return on the market, and of the risk free rate, and by estimating the market risk premium as the difference between the two". We do not consider that there is any substantive difference between APTNT's approach and the Wright approach. See: APTNT, *Amadeus gas pipeline: Access arrangement revised proposal response to draft decision*, January 2016, pp. 68, 75-77.

222 APTNT, *Amadeus gas pipeline: Access arrangement revised proposal response to draft decision*, January 2016, pp. 75-77.

Table 3-5 Issues raised about estimating market risk premium

Issue	Our response
Our approach provides no real regard to the dividend growth model	Consistent with the rate of return Guideline, we use dividend growth model estimates (from our preferred construction of the dividend growth model) to inform the estimate of the market risk premium, having regard to evidence that the output from the models is very sensitive to input assumptions and likely to show an upward bias in current market conditions. This extent is appropriate given the limitations of dividend growth models. See section B.4 for details on the models limitations.
The Wright approach to estimating historical stock returns is useful for estimating market risk premium	Our consideration of the Wright approach is informative of our market risk premium estimate: as a cross-check on our overall return on equity, it is a cross-check on our return on equity parameters, including the market risk premium. However, while we have used a range from the Wright approach to CAPM specification to inform the overall return on equity, we have placed little reliance on this information given we do not agree with its historical form. The CAPM is a forward looking asset pricing model.[223] Historical data (such as historical excess returns on the market) may be used as a basis for estimates of the input parameters into the model where they are good evidence of forward looking parameters. However, we do not consider using historically based estimates that are clearly not representative of the forward looking rate will result in an unbiased estimate of the return on equity. Further details of our reasons are in section B.5 of this attachment.
Information from valuation reports is useful for estimating market risk premium	Our consideration of valuation reports is informative of our market risk premium estimate: as a cross-check on our overall return on equity, they are a cross-check on our return on equity parameters, including the market risk premium. Valuation reports have a different objective to the ARORO, which may make their estimates unsuitable for our purpose. This effect is likely more prevalent for input parameters than the overall return on equity. A lack of transparency on how the return on equity estimates are derived prevents adjusting for these effects. These limitations are discussed further in section F.5.
Surveys should not be relied upon as survey responses are unlikely to be independent	While survey estimates are intended to provide an arm's length assessment, we would not expect them to necessarily have complete impartiality. Survey estimates may strive for objective views but it seems unlikely that they will be entirely uninfluenced by commercial and other external interests. Respondents may also display some 'herding' behaviour. Therefore, we view that survey estimates supply relevant, but not definitive, information and considerable care needs to be taken in the analysis and interpretation of such estimates. Nonetheless, survey estimates explore investor expectations about the market risk premium by directly asking investors and market practitioners what their expectations are and/or what they apply in practice, and we consider this remains useful for informing our market risk premium estimate.
HoustonKemp's analysis of valuation reports indicates an inverse relationship between the risk free rate and the market risk premium	The relationship found by HoustonKemp is driven by the difference between the valuer's chosen risk free rate and the yield on Australian government securities.[224] We continue to be unsatisfied that this difference reflects uplift to the market risk premium, or is a widespread and persistent practice. Further detail of our reasons are in section F.5 of this attachment.
Our concern about sticky dividends creating bias in the dividend growth model is not material in the current market as dividends are	We consider that sticky dividends may create bias in the dividend growth model, and there is no reason to believe that this bias is not material in the current market. Frontier submitted that market capitalisation weighted average earnings per share are forecasted to increase from 2015 to 2017. We consider that expectations reflected in market prices are longer-term than to 2017, such that expectations post-2017 may have greater effect on prices than expectations for 2015 to 2017. Moreover, RBA data suggests that forecast growth in

223 Bringham and Daves, *Intermediate financial management*, Ed. 10, Cengage Learning, 2010, p. 53.

224 HoustonKemp, *The cost of equity: Response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, pp. 48.

forecast to grow from 2015 to 2017[225]	earnings per share will likely slow over the 2015-16 and 2016-17 financial years.[226] We do not consider it is certain that investors expect positive growth in dividends per share post-2017.
Our concern about upwards bias in analysts' dividend forecasts is not material in the current market	Analyst forecasts are well understood to be upwardly biased.[227] Although we show the effect of potential bias of ten percent (see section D.2), the extent of any bias is unclear. No stakeholder has proposed methods to estimate the extent of any bias, and such methods may be complex, without widespread acceptance, and open to gaming. For this reason, we do not apply an adjustment.
Our concern about upwards bias in analysts' dividend forecasts is not relevant as the forecasts reflect analysts' implied discount rates	If analysts' dividend and price forecasts are biased, it is also plausible that the analysts' implied return on equity is biased. McKenzie and Partington also consider that analysts' forecasts are slow to adjust to changing information.[228] This creates problems with time matching analyst dividend forecasts with prices. It also implies that dividend growth models may not track changes in the return on equity accurately.
NERA's adjustment to historical stock returns is more reliable than the ASX's adjustment	We do not consider NERA's adjustment, which is based on less than ten data points out of 300, represents a material improvement in reliability. NERA has also not reconciled the data it uses for its adjustment to the data of the original series. Further details of our reasons are in section B.4 of this attachment.
Arithmetic averaging of historical stock returns is more appropriate than geometric averaging	In estimating the market risk premium, we have regard to both arithmetic and geometric average historical excess returns. Partington and Satchell recommended the consideration of both arithmetic and geometric averages, tempered by an understanding of the potential biases in both.[229] Also, they supported this position in their most recent 2016 report.[230] Further details of our reasons are in section C.3 of this attachment.
We should use only the longest sample period, and we should not use overlapping sample periods, when estimating historical stock returns	Partington and Satchell considered that, although it reduces the precision of the estimates, there are reasons for using multiple sampling periods, such as possible structural breaks in the data and issues regarding data quality.[231] We consider that concerns about data quality become increasingly important the further back into the past one looks. We have regard to five sampling periods because each has different strengths and weaknesses. Further detail of our reasons can be found in section C.1.2 of Attachment 3 to our preliminary decision.
SFG's method for adjusting dividend imputation is more consistent with how we adjust for imputation	We do not agree that there is a consistency issue between our imputation adjustment approach and the post-tax revenue model. We also consider that SFG's method is likely to overestimate the market risk premium as it assumes returns are provided entirely from dividends. Further detail of our reasons can be found in section C.6 of Attachment 3 to our preliminary decision.

225 Frontier Economics, The relationship between government bond yields and the market risk premium, January 2016, p. 39.

226 RBA, *The Australian Economy and Financial Markets Chart Pack,* February 2016, p. 24.

227 McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, pp. 26, 31; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 46, 51; McKenzie and Partington, *The DGM*, December 2013, pp. 8–9. Also see Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 43.

228 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 31–32; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 51.

229 McKenzie and Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, p. 5; Partington and Satchell, *Report to the AER: Return on equity and comment on submissions in relation to JGN*, May 2015, pp. 16–17; Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, pp. 44–45.

230 Partington and Satchell, *Report to the AER: Cost of equity issues–Final decisions for the VIC DNSPs*, April 2016, pp. 49–52.

231 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, pp. 45–46.

credits in the post-tax revenue model.[232]	
We arbitrarily adjust the long-term dividend growth rate used in our dividend growth model	We use the long-term growth rate in real gross domestic product (GDP) as a proxy for the long-term growth rate in dividends. To get an estimate of long-term growth in dividends per share, we adjust the long-term growth rate in real GDP (dividends) downwards to account for the net creation of new shares through share issuances and new companies. The size of our adjustment is not arbitrary but based on the available evidence. Further detail of our reasons can be found in section B.2.1 of Attachment 3 to our preliminary decision.

Estimating equity beta

Equity beta measures the sensitivity of an asset or business's returns to the movements in the overall market returns (systematic or market risk).[233]

We adopt an equity beta point estimate of 0.7 from a range of 0.4 to 0.7. Our equity beta estimate is required to be commensurate with a similar degree of risk as that which applies to JEN's provision of regulated electricity network services.[234] We are satisfied that an equity beta of 0.7 reflects a similar degree of systematic risk as JEN is exposed to in providing regulated services. We hold this view because:

- Our range and point estimate are based on direct measurements (that is, empirical estimates) of the equity beta that businesses with a similar degree of risk as JEN have exhibited in the past. We consider these are reliable indicators of the prevailing, forward-looking equity beta for an efficient business (or benchmark efficient entity) with a similar degree of risk as JEN.
- Our range and point estimate are consistent with our conceptual analysis. This suggests the systematic risk of JEN[235] would be less than the systematic risk of the market as a whole (that is, its equity beta would be less than 1.0). Our conceptual analysis is supported by McKenzie and Partington.[236]
- The theoretical principles underpinning the Black CAPM are reasonably consistent with an equity beta towards the upper end of our range. For firms with an equity

[232] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 62–63; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 17; SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, p. 41.

[233] McKenzie and Partington, *Risk, asset pricing models and WACC*, June 2013, p. 21; Brealey, Myers, Partington, Robinson, *Principles of Corporate Finance*, McGraw-Hill Australia: First Australian Edition, 2000, p. 187.

[234] More precisely, standard control network services, see: NER, cl. 6.5.2(c). For transmission network service providers the rules refer to prescribed transmission services, see NER, cl. 6A.6.2(c). For gas network service providers the rules refer to reference services, see NGR, r. 87(3).

[235] More precisely, an efficient business (or benchmark efficient entity) with a similar degree of risk as that which applies to JEN in the provision of standard control services.

[236] See: McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 10–12; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 31; Partington and Satchell, *Report to the AER: Return on equity and comment on submissions in relation to JGN*, May 2015, p. 6; Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015.

beta below 1.0, the Black CAPM theory may support using a higher equity beta than those estimated from businesses with a similar degree of risk as JEN when used within a Sharpe-Lintner CAPM. This is a result of the Black CAPM relaxing an assumption underlying the Sharpe-Lintner CAPM, which allows for unlimited borrowing and lending at the risk free rate.[237] However, we do not consider the theory underlying the Black CAPM warrants a specific uplift or adjustment to the equity beta point estimate. The reasons for our use of the Black CAPM theory are set out in more detail in section B.2.3.

- We recognise the importance of providing stakeholders with transparency and predictability in our rate of return decisions, which we consider is consistent with the achievement of the ARORO.[238] In this context, a point estimate of 0.7 is consistent with our Guideline (which was developed following extensive consultation) and is a modest step down from previous regulatory determinations.[239] It also recognises the uncertainty inherent in estimating unobservable parameters, such as the equity beta for a benchmark efficient entity.

Our direct measurements of the equity beta for businesses with a similar degree of risk as JEN are primarily based on an expert report from Professor Olan Henry (Henry), which uses data for a set of Australian energy network businesses up to 28 June 2013.[240] We also consider a number of other empirical studies of the equity beta of Australian energy network businesses. These empirical studies show a consistent pattern of equity beta estimates that is robust to the use of different econometric methods and time periods. From 2002 to 2014, these empirical studies present equity beta estimates that converge on the range of 0.4 to 0.7.[241] We also consider recent equity beta estimates for international energy businesses, which range from 0.3 to 1.0. However, the pattern of international estimates is not consistent and we consider international businesses are less likely than Australian businesses to have a similar degree of systematic risk as JEN. More information on empirical estimates can be found in section G.

237 However, the Black CAPM replaces this with an assumption of unlimited ability to short sell stocks.

238 Stakeholders, particularly service providers, sought greater certainty of process. See: AER, *Explanatory statement: Rate of return guideline*, December 2013, p. 51; AEMC, *Final rule determination*, November 2012, pp. 42–43, 45, 50; RARE Infrastructure Limited, *Submission to AER's rate of return guidelines consultation paper*, June 2013; The Financial Investor Group, *Response to the AER's rate of return guidelines consultation paper*, June 2013, p. 1; ENA, *Submission to AER's rate of return guidelines issues paper*, February 2013, p. 4; PIAC, *Submission to AER's rate of return guidelines issues paper*, February 2013, p. 17.

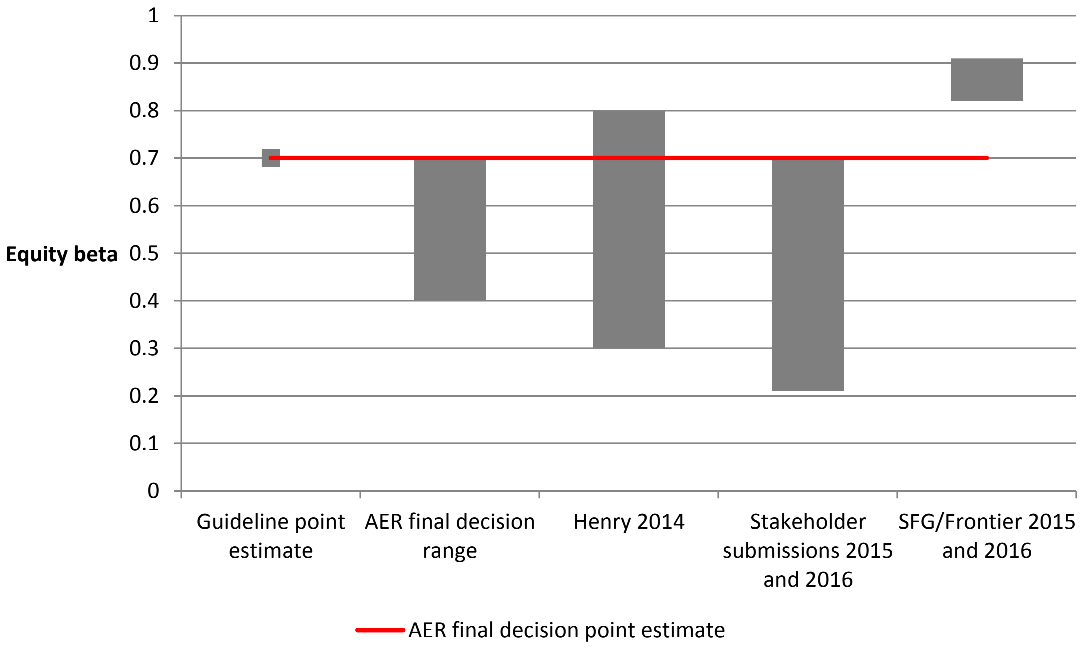
239 That is, determinations prior to the 2012 Rule change. From 2010 to early 2014, all our regulatory determinations have applied an equity beta of 0.8. See: AER, *Review of the WACC parameters: final decision*, May 2009, p. v.

240 Henry, *Estimating β: An update*, April 2014, p. 9.

241 As discussed in detail in section G.1, we do not consider individual firm equity beta estimates in isolation. This is because no particular energy network firm in our comparator set is perfectly representative of the benchmark efficient entity. We consider averages of individual firm estimates and estimates from various portfolios of firms are more likely to be reflective of the benchmark efficient entity. However, we place no material reliance on time varying portfolio estimates, as according to Henry, they are not grounded in financial theory and are prone to measurement error. See: Henry, *Estimating β: an update*, April 2014, p. 52.

We consider the evidence in Henry's 2014 report suggests a best empirical estimate for the equity beta of approximately 0.5. However, we consider that the international estimates, in conjunction with considerations of the Black CAPM and investor certainty (as discussed above), support a higher estimate and an estimate at the upper end of our range.[242] Our equity beta point estimate also provides a balanced outcome given the submissions by stakeholders and services providers, as shown in Figure 3-4.

Figure 3-4 Submissions on the value of the equity beta



Source: AER analysis[243]

Note: Henry 2014 presents the range specified in Henry's 2014 report (0.3 to 0.8). The stakeholder submissions range is intended to reflect the views of consumer groups and those who use/engage with the energy network (or pipeline), and as such it does not include submissions from network (or pipeline) service providers. The lower bound of this range is based on the CCP's submission and the upper bound is based

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242 But does not support an estimate beyond our range. We hold this view based on:
(1) the outcome of our conceptual analysis that a business with a similar degree of risk as JEN (in providing regulated services) is likely to have an equity beta less than one;
(2) our assessment of the relative merits of the material, and conclusion that greater weight should be placed on Australian empirical estimates than international estimates or the theory of the Black CAPM.

243 Based on our decision and the following reports: AER, *Rate of return guideline*, 17 December 2013, p. 15; Henry, *Estimating β: An update*, April 2014, p. 63; CCP2 (Bruce Mountain), *Submission on the AER's preliminary decisions for the Qld/SA distribution network service providers (2015-20),* 29 July 2015, pp. 10-11; Origin Energy, *Submission on the AER's preliminary decisions on the Victorian distribution network service providers for 2016–20*, 6 January 2016, p. 3. SFG/Frontier submitted 0.82 (under multiple model approach for return on equity) in SFG, *The required return on equity for the benchmark efficient entity*, 25 February 2015, p. 20; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 4; and Frontier, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 3. SFG/Frontier submitted 0.91 (under alternative 'foundation model' approaches for return on equity) in SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 35; Frontier, *The required return on equity under a foundation model approach*, January 2016, p. 11.

on Origin's submission. The SFG 2015 and 2016 range lower bound is based on SFG/Frontier's regression analysis of Australian and US firms (submitted under a multiple model approach for the return on equity) and the upper bound is based on SFG/Frontier's multiple model based equity beta estimates (under its alternative 'foundation model' approaches for the return on equity).

We note that some stakeholders submitted that we place too much reliance on some material, that we did not have appropriate regard to information from other relevant sources, or that we made inappropriate methodological choices in our empirical analysis. Table 3-6 sets out stakeholder views on our use of relevant material. We also note that Partington and Satchell, having reviewed the relevant submissions, continue to support our foundation model approach.[244]

Having considered the overall information and all material before us, at this time we are not satisfied that these submissions indicate a departure from the Guideline would contribute to the achievement of the ARORO. We are satisfied that an equity beta of 0.7 will contribute to the achievement of the ARORO and the NEO.[245]

Table 3-6 Issues raised on the estimation of equity beta

Issue	Our response
Empirical analysis	
Our comparator set of Australian energy network firms is too small and results in unreliable equity beta estimates[246]	We do not consider our Australian empirical equity beta estimates are unreliable. SFG appears to have taken a narrow definition of what is reliable in this context. Decreasing the dispersion of estimates by increasing the size of the comparator set may not be helpful if that comparator set is less representative of what we are trying to estimate. We consider the data from our comparator set of Australian energy network firms is sufficient for us to form an equity beta estimate that will contribute to the achievement of the ARORO. The comparator set contains firms with a similar degree of risk as that which applies to JEN's provision of regulated services. This comparator set generates a consistent pattern of empirical equity beta estimates that is robust across econometric techniques, time periods and different combinations of comparator firms. We consider this issue in more detail in section G.4.2 of this attachment. We also considered this issue in detail in sections D.2.1,

[244] Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, p. 8.

[245] NER, cl. 6.5.2(f); NER, cl. 6A.6.2(f); NGR, r. 87(6). NEL, s.16; NGL, s. 23.

[246] SFG, *Beta and the Black capital asset pricing model*, February 2015, pp. 10–11; Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 13–19. CitiPower, Powercor, United Energy, JEN, AusNet, AGN and ActewAGL submitted these reports with their initial and revised proposals respectively. Also see CitiPower, *Revised proposal*, January 2016, p. 311–312; Powercor, *Revised proposal*, January 2016, pp. 305-306; United Energy, *Response to AER Preliminary Determination Re: Rate of return and gamma*, January 2016, pp. 65-66; JEN, *Revocation and substitution submission attachment 6-1*, January 2016, pp. 70-71; AusNet, *Revised regulatory proposal*, January 2016, pp. 64-65; AGN, *Revised SA access arrangement information* attachment 10.26, January 2016, pp. 69-70; and ActewAGL, *Revised 2016-21 access arrangement proposal appendix 5.01*, January 2016, pp. 87-88.

	D.2.3, and D.5.1 of Attachment 3 to JEN's preliminary decision and that reasoning remains relevant.
Our comparator set should include international energy firms (specifically, 56 US firms) and Australian non-energy infrastructure firms[247]	We consider international energy firms are unlikely to have a similar degree of risk as JEN (in the provision of regulated services), for several reasons set out in section G.4.3 of this attachment. We also considered this issue in detail in section D.2.1 of Attachment 3 to JEN's preliminary decision. We also consider other (Australian) infrastructure firms are not suitable comparators to the benchmark efficient entity in this case, for several reasons set out in section G.4.4 of this attachment.
Our comparator set should not be restricted to regulated entities as the benchmark efficient entity should be defined as an unregulated entity operating in a workably competitive market[248]	We do not agree. We consider the regulatory framework for the provision of standard control services mitigates the risk exposure that service providers face in significant respects and therefore must be properly accounted for in equity beta estimates. Incentive regulation typically allows businesses to earn more stable cash flows with periodic resetting of revenues to better reflect actual expenditure. Most unregulated businesses do not have these same protections or restrictions, and so are likely to have a very different risk profile. We carefully considered these factors when developing the Guideline. Overall, we consider that a substantial proportion of the regulatory framework has the effect of mitigating various systematic and non-systematic risks.
Our comparator set should exclude firms that are less comparable to the benchmark efficient entity (e.g. have a low proportion of regulated assets)[249]	We are satisfied, at this time, that our comparator set is sufficiently reflective of the benchmark efficient entity, given the trade-off between increased statistical precision from a larger comparator set and comparability of the firms to the benchmark efficient entity. For

247 Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 26–34. Also see CitiPower, *Revised proposal*, January 2016, p. 312–314. Powercor, United Energy, JEN, AusNet, AGN and ActewAGL's revised proposals contain similar reasoning.
Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 306–308; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 88–91; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 66–68; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 70–72; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 71–73; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 65–67.

248 CitiPower, *Revised proposal*, January 2016, p. 310. Powercor, United Energy, JEN, AusNet, AGN and ActewAGL's revised proposals contain similar reasoning. Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 304; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 87–88; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 64–65; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, p. 69; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 69–70; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 63–64.

249 CCP3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, August 2015, pp. 75–77, CCP2 (Bruce Mountain), *Submission on the AER's preliminary decisions for the Qld/SA distribution network service providers (2015-20)*, July 2015, pp. 9–10; CCP3, *Response to AER preliminary decisions and revised proposals for Victorian electricity distribution network service providers for a revenue reset for the 2016-2020 regulatory period*, February 2016, pp. 92–93.

	more detail, see section D.2.1 of Attachment 3 to JEN's preliminary decision.
Our comparator set should exclude delisted firms whose data are outdated[250]	In relation to the exclusion of delisted firms, we acknowledge that some of our comparator firms have been delisted for some time. However, we consider three estimation periods in our empirical analysis, one of which is the last five years. This captures the more recent data and excludes Alinta, AGL Energy Limited and GasNet (who only have relevant data to 2006 or 2007). The average estimate from this estimation period is not substantially different from the longer estimation periods (in fact, it is slightly lower, see Table 3-35). The two most recent portfolios we consider (P4 and P5) also provide estimates that are, overall, not substantially different from the portfolios that include older data (see Table 3-36). We consider these results suggest that including older data in our empirical analysis (which increases the size of our dataset) does not bias the results.
The Least Absolute Deviations (LAD) estimation method produces systematically downward biased equity beta estimates and should not be used[251]	We are not satisfied that SFG has produced compelling evidence to infer the LAD estimator produces systematically downward biased estimates of equity beta. For example, we consider that discovering LAD estimates are lower than Ordinary Least Squares (OLS) estimates ex post, on a particular subset of the market, does not necessarily indicate systematic bias. In any case, we rely more on OLS estimates and consider that removing LAD estimates from our empirical analysis would not substantially change our empirical results. We considered this issue in section D.2.2 of Attachment 3 to JEN's preliminary decision and that reasoning remains relevant.
The mining boom should be excluded from the estimation periods[252]	We consider that, at any given time, there are sectors of the economy that are experiencing relative booms and busts. As such, we do not consider the mining boom period represents an exceptional circumstance that should be removed from the estimation periods we use to estimate the equity beta. For more detail see section D.2.2 of Attachment 3 to JEN's preliminary decision.
We do not account for variation in equity beta estimates based on how the return interval is defined (in particular, what reference day is chosen to calculate weekly or monthly returns)[253]	We do not consider that SFG has provided any basis to expect that returns based on a particular day of the week will underestimate or overestimate equity beta for the benchmark efficient entity. For more detail see section D.2.2 of Attachment 3 to JEN's preliminary decision.

250 CitiPower, *Revised proposal*, January 2016, pp. 310–311. Powercor, United Energy, JEN, AusNet, AGN and ActewAGL's revised proposals contain similar reasoning.
Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 304–305; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 87–88; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 64–65; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 69–70; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 69–70; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 63–64.

251 Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 4.

252 CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 33–34, 46–58. APTNT submitted this report with its initial proposal.

253 SFG, *Beta and the Black capital asset pricing model*, February 2015, pp. 29–30.

Only re-levered equity beta estimates should be relied on[254]	We consider it is useful to consider both raw and re-levered equity beta estimates where possible. On one hand, the resulting estimates will be more aligned with our benchmark. On the other hand, the relationship between equity beta, financial leverage and financial risk is complex and uncertain. Making a specific adjustment for leverage imposes a certain assumed relationship that may not necessarily be correct in all circumstances. For more detail see sections D.2.2 and D.3 of Attachment 3 to JEN's preliminary decision. In their most recent report, Partington and Satchell reiterate their view that re-levering equity betas is problematic.[255]
Averages of individual firm estimates are largely meaningless[256]	Because no one comparator firm is perfectly reflective of a benchmark efficient entity with a similar degree of risk as that which applies to JEN in providing regulated services, we rely on averages of individual firm estimates to determine an equity beta range. SFG, Frontier Economics, CEG and NERA, in their reports for several service providers, also rely on averages of individual firm estimates.[257] For more detail see section D.2.2 of Attachment 3 to JEN's preliminary decision.
The basis of the portfolio formations in Henry's 2014 report is unclear[258]	Each firm in a particular portfolio must have returns data over the same period. For example, we cannot include a firm with data from 2000 to 2007 in a portfolio with another firm with data from 2005 to 2013. A portfolio can only be formed in this scenario if common data from 2005 to 2007 is used. The firms in our comparator set trade over different time periods (that is, they have returns data over different periods). Therefore, in forming our portfolios, we balanced the desirability of having a long time period that includes recent data with the desirability of having more firms in the portfolio. We also sought to capture each firm in our comparator set in at least one portfolio.[259]

254 Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, p. 46. CitiPower, Powercor, United Energy, JEN, AusNet, AGN and ActewAGL submitted this report with their revised proposals. Also see Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 5–6.

255 Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, p. 10.

256 CitiPower, *Revised proposal*, January 2016, p. 314; Powercor, *Revised proposal*, January 2016, p. 308; United Energy, *Response to AER preliminary decision re rate of return, gamma*, January 2016, p. 68; JEN, *Revocation and substitution submission attachment 6-1*, January 2016, p. 73; AusNet, *Revised regulatory proposal*, January 2016, p. 7-67; AGN, *Revised SA access arrangement information*, January 2016, p. 72; ActewAGL, *Revised 2016-21 access arrangement proposal appendix 5.01*, January 2016, p. 91.

257 SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, pp. 2, 13; Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 6; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 58; NERA, *Return on capital of a regulated electricity network*, May 2014, pp. 79–81.

258 CitiPower, *Revised proposal*, January 2016, p. 314; Powercor, *Revised proposal*, January 2016, p. 308; United Energy, *Response to AER preliminary decision re rate of return, gamma*, January 2016, p. 68; JEN, *Revocation and substitution submission attachment 6-1*, January 2016, p. 73; AusNet, *Revised regulatory proposal*, January 2016, p. 7-67; AGN, *Revised SA access arrangement information*, January 2016, p. 72; ActewAGL, *Revised 2016-21 access arrangement proposal appendix 5.01*, January 2016, pp. 91-92.

259 See Henry, *Estimating β: An update*, April 2014, p. 35.

The Vasicek adjustment mitigates systematic estimation error[260]	We do not apply a Vasicek adjustment. We note that SFG's application of the Vasicek adjustment assumes a prior distribution of the market as a whole, not the firms that represent the benchmark efficient entity. We also note that applying the Vasicek adjustment in the manner recommended by SFG made little to no difference to the empirical equity beta estimates. For more detail see section D.2.2 of Attachment 3 to JEN's preliminary decision.
Australian empirical estimates	
Our range derived from Australian empirical estimates (0.4 to 0.7) is incorrect and inconsistent with Henry's 2014 report[261]	We recognise Henry reported a range of 0.3 to 0.8. However, while Henry appears to base his range on all his estimates (including individual firm estimates), we consider the most useful empirical estimates in our regulatory context are averages of individual firm estimates and fixed weight portfolio estimates. We note, in any case, that a point estimate of 0.7 is consistent with, and at the higher level of, the range identified by Henry. For more detail see section D.5.1 of Attachment 3 to JEN's preliminary decision.
Service providers submit that the equity beta estimates in Henry's 2014 report are highly variable and imprecise[262] Other stakeholders submit that the equity beta estimates in Henry's 2014 report are clustered around a range of 0.3 to 0.5[263]	Both viewpoints are based on individual firm estimates. We consider the most useful empirical estimates are averages of individual firm estimates and fixed weight portfolio estimates, and these estimates range from 0.4 to 0.7 under almost every regression permutation considered in Henry's 2014 report. For more detail, see section D.2.3 of Attachment 3 to JEN's preliminary decision.
Australian empirical estimates support an	We are satisfied the Australian empirical estimates we consider

260 SFG, *Beta and the Black capital asset pricing model*, February 2015, p. 31; Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 4–5.

261 Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, p. 39. Also see CitiPower, *Revised proposal*, January 2016, pp. 314–315. Powercor, United Energy, JEN, AusNet, AGN and ActewAGL's revised proposals contain similar reasoning.
Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 308–309; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 91–92; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, p. 68; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 72–73; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 73–74; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, p. 67.

262 SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 10–11. Also see CitiPower, *Revised proposal*, January 2016, p. 311–312. Powercor, United Energy, JEN, AusNet, AGN and ActewAGL's revised proposals contain similar reasoning.
Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 305–308; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 87–89; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 65–66; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 69–71; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 70–72; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 64–65.

263 VECUA, *Submission on the AER: AER preliminary 2016–20 revenue determinations for the Victorian DNSPs*, January 2016, pp. 17–18.

equity beta within the range of 0.5 to 0.6[264]	support an equity beta range of 0.4 to 0.7. Our range is based on averages of individual firm estimates and fixed weight portfolio estimates from Henry's 2014 report. We also consider equity beta estimates from a number of other Australia empirical studies. This includes the ERA's 2013 study, which appears to contain the same estimates as the Vo, Mero and Gellard study discussed in the Consumer Challenge Panel's report.[265] See sections G.1 and G.2. We have regard to other information when selecting our equity beta point estimate from within this range. This includes international empirical estimates and the theoretical principles underpinning the Black CAPM. See section D.5 of Attachment 3 to JEN's preliminary decision.
We have incorrectly analysed the equity beta estimates in Grant Samuel's 2014 independent expert report[266]	We do not average across the different sources for each energy network firm in Grant Samuel's peer group. We average over the four Australian energy network firms in the peer group for each source. For more detail see section D.2.4 of Attachment 3 to JEN's preliminary decision.
International empirical estimates	
Our analysis of international empirical estimates is incorrect because we do not consider the relative reliability of different studies[267]	The reports we review above are from reputable sources. Different reports use different estimation techniques because experts have different views on how best to estimate equity beta. It would be difficult to find reports that are fully consistent with our preferred estimation approach. For more detail see section D.3 of Attachment 3 to JEN's preliminary decision.
The international empirical estimates we consider (correctly analysed) are consistent with an equity beta estimate materially above 0.7[268]	We do not agree with SFG's interpretation of the international evidence we consider. We do not consider this evidence implies an equity beta estimate materially above 0.7 for the benchmark efficient entity. For more detail see section D.3 of Attachment 3 to JEN's preliminary decision.
Theoretical principles underpinning the Black CAPM	
We use the theory of the Black CAPM to apply a specific uplift to equity beta to correct for 'low beta bias'—however, the adjustment is insufficient to correct for this bias in the Sharpe-Lintner CAPM[269]	We do not use the theory underlying the Black CAPM to apply a specific uplift to the equity beta (and we did not do so in the Guideline). We do not consider that the theory of the Black CAPM can reliably support a specific uplift or that it implies that the Sharpe-Lintner CAPM produces biased return on equity estimates. For more

[264] CCP3, *Response to AER preliminary decisions and revised proposals for Victorian electricity distribution network service providers for a revenue reset for the 2016-2020 regulatory period*, 25 February 2016, pp. 89–94.

[265] See Vo, Mero, Gellard, *Equity beta for the Australian utilities is well below 1.0*, March 2014. In this report, tables 1–12 and figures 1–8 appear to be the same as tables 19–29, 37, and figures 19–26 in the ERA's rate of return guideline (see ERA, *Explanatory statement for the rate of return guidelines*, December 2013, pp. 167–196).

[266] Grant Samuel and Associates, *Letter—Grant Samuel response to AER draft decision*, 12 January 2015, p. 8. CitiPower, Powercor, JEN and United Energy submitted this report with their initial proposals.

[267] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 18; Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, pp. 46–50.

[268] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 18; Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, pp. 50–51.

[269] Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, pp. 40–41. Also see CitiPower, *Revised proposal*, January 2016, pp. 315–316; Powercor, *Revised proposal*, January 2016, pp. 309-310; United Energy, *Response to AER preliminary decision re rate of return, gamma*, January 2016, pp. 68-70; JEN, *Revocation and substitution submission attachment 6-1*, January 2016, pp. 74-75; AusNet, *Revised regulatory proposal*, January 2016, pp. 7-67 to 7-69; AGN, *Revised SA access arrangement information*, January

	detail see sections D.4, D.5.3, and A.2 of Attachment 3 to JEN's preliminary decision.
Our use of the theory of the Black CAPM to inform the equity beta point estimate is arbitrary and/or convoluted.[270] The correct use of the Black CAPM (under our foundation model approach) is to use it empirically—this results in an equity beta estimate materially higher than 0.7[271]	We consider it is open to us to consider the theory underlying the Black CAPM in informing our equity beta estimate. However, we consider the practical application of the Black CAPM produces unreliable empirical estimates. We set our reasons for not relying on empirical estimates of the Black CAPM, and for giving the theory of the Black CAPM an informative role in estimating equity beta, in section 3.4.1 (steps one and two) of JEN's preliminary decision.
Neither the theory nor empirical evidence from the Black CAPM should be used to inform the equity beta point estimate[272]	We consider there are merits to the theoretical principles underpinning the Black CAPM (for example, it relaxes an assumption underlying the Sharpe-Lintner CAPM),[273] and we have assessed this information against the criteria set out in the Guideline. We consider this theory can be useful in informing our equity beta point estimate. For more detail see section D.4 of Attachment 3 to JEN's preliminary decision and section B.2.3 of this decision. We also do not consider our consultants disagree with our use of this information. In fact, Partington and Handley have both provided support for our foundation model approach.[274] Our foundation model

2016, pp. 73-4; ActewAGL, *Revised 2016-21 access arrangement proposal appendix 5.01*, January 2016, pp. 92-94.

270 SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 23–24, 35; Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, pp. 40–41. Also see CitiPower, *Revised proposal*, January 2016, pp. 315–316. Powercor, United Energy, JEN, AusNet, AGN and ActewAGL's revised proposals contain similar reasoning.
Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 309–310; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 93–94; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 69–70; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 73–74; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 74–75; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 68–69.

271 In its report 'Beta and the Black CAPM', SFG recommends using empirical results from the Black CAPM to adjust the Sharpe-Lintner CAPM equity beta estimate to 0.91 (see SFG, *Beta and the Black capital asset pricing model*, February 2015, pp. 32–35). In its report 'The required return on equity under a foundation model approach', Frontier Economics (previously SFG) recommends using empirical results from the Black CAPM to adjust the Sharpe-Lintner CAPM equity beta estimate for 'low beta bias', which results in an equity beta estimate of 0.88 (this excludes the subsequent adjustment for 'book-to-market bias using the Fama French model) (see Frontier, *The required return on equity under a foundation model approach*, January 2016, pp. 52–57).

272 See CCP2 (Bruce Mountain), *Submission on the AER's preliminary decisions for the Qld/SA distribution network service providers (2015-20)*, 29 July 2015, p. 10; CCP3, *Response to AER preliminary decisions and revised proposals for Victorian electricity distribution network service providers for a revenue reset for the 2016-2020 regulatory period*, 25 February 2016, pp. 89–90.

273 This assumption allows for unlimited borrowing and lending at the risk free rate. However, the Black CAPM replaces this with an assumption of unlimited ability to short sell stocks.

274 Partington, *Report to the AER: Return on equity (updated)*, April 2015, p. 33; Handley, *Advice on the return on equity*, October 2014, p. 5. Both consultants reiterated their support for our foundation model approach in their subsequent reports (see Partington and Satchell, *Return on equity and comment on submissions in relation to JGN*, May 2015, p. 6; Partington and Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 15; Handley, *Advice on the rate of return for the 2015 AER energy network determination for Jemena Gas Networks*, May 2015, p. 28).

	approach includes our use of the theory of the Black CAPM to inform the equity beta point estimate
Conceptual analysis	
The reduction in systematic risk (specifically, demand risk) from a recent transition to a revenue cap from a price cap should be reflected in the equity beta[275]	We consider differences in demand risk can be mitigated through either form of control. Under a revenue cap, where forecast quantity demanded differs from actual quantity demanded, price adjustments are made in subsequent years to enable the approved revenue to be recovered by the service provider. Under a price cap, service providers may mitigate the risk of forecast error by restructuring tariffs, such that higher fixed charges are set to offset demand volatility. This is one of the reasons why, in the Guideline, we considered the systematic risks between gas, electricity, transmission and distribution networks are sufficiently similar as to justify one benchmark.[276] Even if moving to a revenue cap from a price cap did reduce the systematic risk of a service provider, we consider this would be reflected in lower business risk. This is only one aspect of our overall systematic risk assessment, which includes consideration of financial risk.
Our assessment of financial risk and its impact on overall systematic risk is incorrect[277]	We disagree. We consider financial risk relates to the additional systematic risk exposure that arises from the debt holdings of a firm and recognise the benchmark efficient entity is likely to have higher financial risk than the market average firm because it has relatively high financial leverage. However, the exact relationship between financial risk and financial leverage is not straightforward. We consider our conceptual analysis suggests the intrinsic business risk of a firm is the main driver of its systematic risk. We expect a business with a similar degree of risk as JEN in providing regulated services to have low intrinsic risk exposure (relative to the market average). We also consider the high financial leverage of a benchmark efficient entity (relative to the market average) does not necessarily correspond to an equivalently high exposure to financial risk. Therefore, we consider there are reasonable conceptual grounds to expect the overall systematic risk for a business with a similar degree of risk as JEN to be below that of the market average firm. Our views are supported by McKenzie and Partington. For more detail see section D.1 of Attachment 3 to JEN's preliminary decision.
We have misinterpreted the empirical evidence and expert reports we rely on (including Frontier Economics' 2013 report to the AER)[278]	We do not consider the empirical evidence referred to by McKenzie and Partington in their 2012 report has been misinterpreted. We also consider Frontier Economics have misunderstood our use of the information provided in its 2013 report. Regardless, Frontier's views (in its 2015 report) do not change our key conclusion on financial risk. For more detail see sections D.1.2 and D.1.3 of Attachment 3 to

275 See VECUA, *Submission on the AER: AER preliminary 2016–20 revenue determinations for the Victorian DNSPs*, January 2016, p. 18; CCP3, *Response to AER preliminary decisions and revised proposals for Victorian electricity distribution network service providers for a revenue reset for the 2016-2020 regulatory period*, 25 February 2016, pp. 89, 94–95.

276 AER, *Explanatory statement to the rate of return guideline*, December 2013, p. 33.

277 Frontier Economics, *Review of the AER's conceptual analysis for equity beta*, June 2015, pp. 8–19. CitiPower, Powercor, United Energy, JEN, AGN and ActewAGL submitted this report during the decision process.

278 Frontier Economics, *Review of the AER's conceptual analysis for equity beta*, June 2015, pp. 8–19.

	JEN's preliminary decision.
Our conceptual analysis is unclear and likely to be counterproductive to good regulatory decisions[279]	We disagree with this view. Frontier's analysis appears to be based on a misunderstanding of the role of our conceptual analysis. For more detail see section D.1.3 of Attachment 3 to JEN's preliminary decision.
We have not adequately accounted for the recent risks arising from disruptive technologies[280]	We do not consider the risk arising from disruptive technologies can be reasonably classified as systematic risk, and so should not be compensated for in the return on equity. For more detail see section D.1.4 of Attachment 3 to JEN's preliminary decision.
Other	
Our approach is inconsistent with the approach we used to estimate equity beta in the 2009 WACC review because we have selected a different point estimate from the same range[281]	We disagree. During the Guideline process we stated, 'During both the 2009 WACC review and now we considered the empirical estimates support a range of 0.4 to 0.7. In the 2009 WACC review, we adopted a point estimate of 0.8 (slightly above the range of empirical estimates). In this issues paper, we propose to lower our point estimate from 0.8 to 0.7 because we now have greater confidence in the reliability of the empirical estimates—In 2009, there were fewer empirical estimates available. The data spanned a shorter time period and we were facing uncertainty due to the global financial crisis. Four years on, we now have more studies, spanning a longer time period and a diversity of market conditions. The results from these studies demonstrate a consistent pattern over time.'[282] For more detail see section D.5.2 of Attachment 3 to JEN's preliminary decision.
Our multi-stage approach to estimating the equity beta pre-emptively dilutes or eliminates the impact of other relevant evidence[283]	Our use of relevant material is based on their relative merits (see section D.5.3 of Attachment 3 to JEN's preliminary decision).
Our estimate of equity beta does not sufficiently account for possible biases in the Sharpe-Lintner CAPM—our equity beta estimate should be specifically adjusted for 'low beta bias' and/or 'book-to-market bias'	We do not consider our use of the Sharpe-Lintner CAPM in our foundation model approach will result in a downward biased estimate of the return on equity. We provide extensive reasoning for these views in the 'service providers' proposed multi-model approach' subsection in section 3.4.1 of this attachment. Also see sections

279 Frontier Economics, *Review of the AER's conceptual analysis for equity beta*, June 2015, pp. 6–7.

280 Frontier Economics, *Review of the AER's conceptual analysis for equity beta*, June 2015, pp. 20–26.

281 SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 24–25.

282 AER, *Equity beta issues paper*, October 2013, p. 7. We provided similar reasoning in the final Guideline. See: AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 84–85.

283 Frontier, *Key issues in estimating the return on equity for the benchmark efficient entity*, June 2015, pp. 20–25, 47–54. CitiPower, Powercor, United Energy, JEN, AGN and ActewAGL submitted this report during the decision process. Also see Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, p. 39.

CitiPower, *Revised proposal*, January 2016, pp. 311–313; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 305–307; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 87–91; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 65–67; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 69–71; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 70–72; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 64–66.

using empirical evidence from the Black CAPM and Fama French model[284]	D.5.3, A.2, A.3 of Attachment 3 to JEN's preliminary decision.
An equity beta estimate implied from SFG's construction of the dividend growth model should be used as a cross check on our foundation model equity beta estimate[285]	SFG's dividend growth model-based estimates of equity beta are derived by estimating the relative risk ratio of Australian energy network firms to the market, which it uses as an implied beta estimate. We consider there are several technical issues with SFG's approach. These include: the method used to derive its implied beta estimate is not aligned with the definition of equity beta; its implied beta estimate is based on a relatively small dataset; and it used inappropriate weightings in the estimation process. For more detail see sections B.3 and D.5.3 of Attachment 3 to JEN's preliminary decision.
The equity beta should be 0.8 because a change from our previous estimate is not warranted[286]	We do have regard to our previous beta estimates in the context of the stated preferences of investors and stakeholders for transparency and predictability. However, we also consider evidence from updated empirical estimates, conceptual analysis, and the theory of the Black CAPM and find that, on balance, the evidence supports an equity beta of 0.7.

Source: AER analysis; numerous stakeholder submissions.

The overall return on equity

To inform the reasonableness of the foundation model return on equity estimate, we estimate and evaluate values from other relevant sources of information (steps four and five of the foundation model approach).[287] In having regard to prevailing market conditions we have also examined recent movements in the relevant material.

Our task is to set the allowed rate of return to be commensurate with a similar degree of risk as that which applies to JEN with respect to the provision of standard control services.[288] This requires us to consider the additional riskiness of JEN[289] relative to the risk free asset, and the commensurate return that equity investors require to take on this additional risk. Hence, the critical allowance is the allowed equity risk premium

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284 Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, pp. 41–42, 65–66. Also see CitiPower, *Revised proposal*, January 2016, pp. 324–326; Powercor, *Revised proposal*, January 2016, pp. 318-320; United Energy, *Response to AER Preliminary Determination Re: Rate of return and gamma*, January 2016, pp. 77-78; JEN, *Revocation and substitution submission attachment 6-1*, January 2016, pp. 83-84; AusNet, *Revised regulatory proposal*, January 2016, pp. 76-77; AGN, *Revised SA access arrangement information* attachment 10.26, January 2016, pp. 81-82; and ActewAGL, *Revised 2016-21 access arrangement proposal appendix 5.01*, January 2016, pp. 104-105.

285 Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, pp. 41–42, 64–65.

286 APTNT, *Revised access arrangement proposal: Response to draft decision submission*, January 2016, pp. 74–75.

287 This includes broker reports, independent valuation reports, other regulators' decisions, the Wright approach and comparison between the return on equity and return on debt.

288 In respect of the provision of network services. While there may be many various risks associated with providing regulated network or pipeline services, we consider that (consistent with modern portfolio theory) the rate of return will be commensurate with efficient financing costs if it reflects only non-diversifiable risks. Diversifiable risk can be addressed through other regulatory mechanisms, such as capex and opex allowances.

289 Or more precisely, a benchmark efficient entity with a similar degree of risk as JEN in respect of the provision of standard control services.

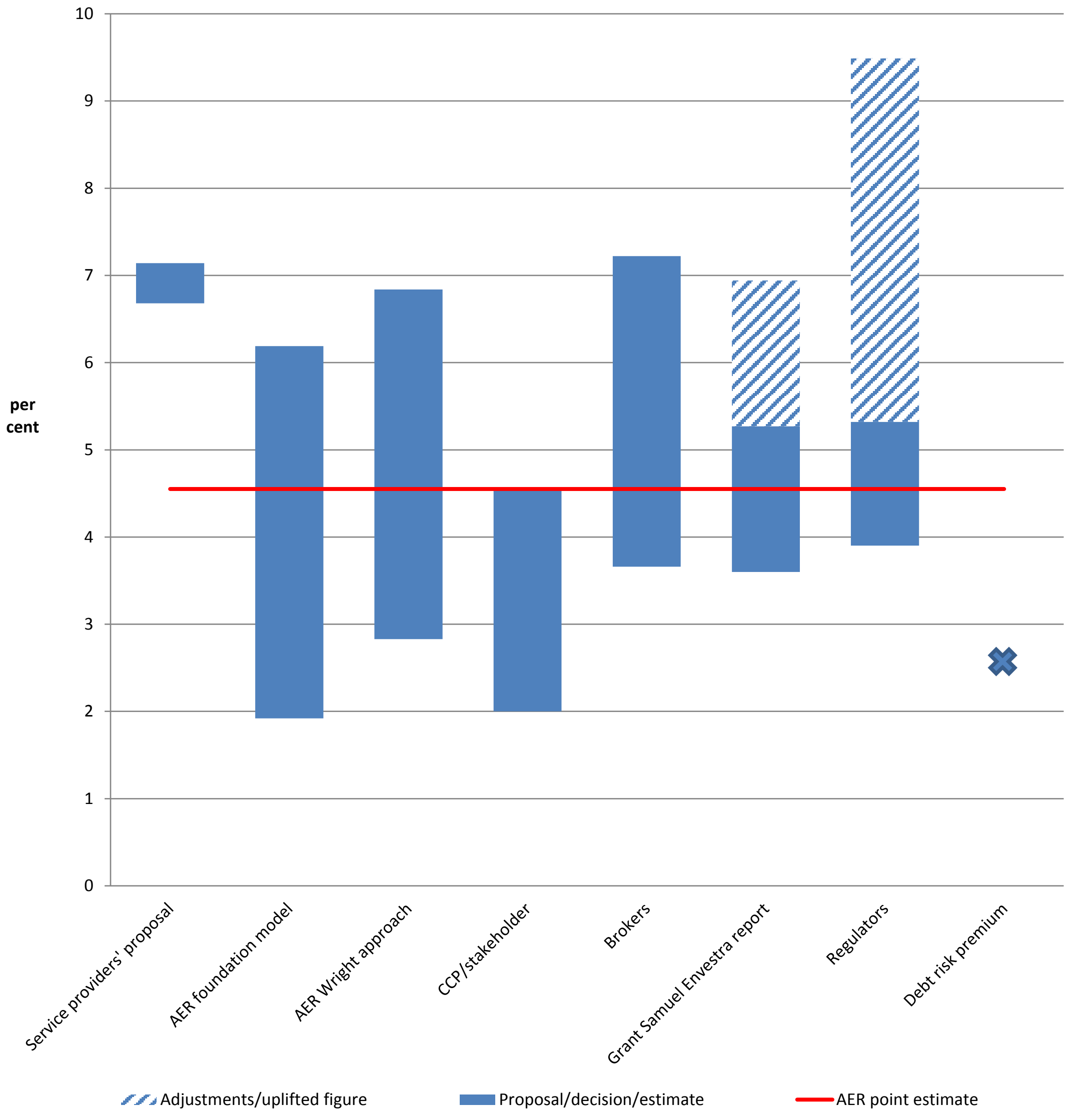
over and above the estimated risk free rate at a given time. Figure 3-5 compares our foundation model equity risk premium to other relevant material[290] that can inform our estimate of return on equity and equity risk premium.

We consider that, on the whole, the other material[291] broadly supports our foundation model estimate of the return on equity. Overall, we find that this information does not indicate a material, sustained change in market conditions since our preliminary decision sufficient to cause us to move away from our foundation model estimate.

[290] The Rate of Return Guideline outlines the use of certain other material to inform our final estimate of the return on equity: the Wright approach, other regulators' estimates, broker returns, independent export reports and comparison with return on debt. See: AER, *Better Regulation: Explanatory Statement, Rate of Return Guideline*, December 2013, p. 61.

[291] The other material include our construction of the Wright CAPM, other regulators' estimates, comparison with return on debt and relevant broker and independent expert reports.

Figure 3-5 Comparison of our foundation model equity risk premium



Source: AER analysis and various submissions and reports.

Notes: The AER foundation model equity risk premium (ERP) range uses the range and point estimate for market risk premium and equity beta. The calculation of the Wright approach is set out in section C.2. The calculation of brokers and other regulators ranges is outlined in Appendix F. The calculation of debt risk premium is in Appendix E.3.

Grant Samuel's final WACC range included an uplift above an initial SLCAPM range. Grant Samuel made no explicit allowance for the impact of Australia's dividend imputation system. The upper bound of the range shown above includes the uplift and an adjustment for dividend imputation, while the lower bound does not. The upper shaded portion of the range includes the entirety of the uplift on return on equity and a full dividend imputation adjustment.[292]

[292] Grant Samuel, *Envestra: Financial services guide and independent expert's report*, March 2014, Appendix 3.

The shaded portion of the other regulators range represents the impact of rail, transport and retail gas decisions on the range. We consider these industries are unlikely to be comparable to the benchmark efficient entity.

The service provider proposals range is based on the proposals from businesses for which we are making decisions in May 2016.[293] The lower bound of the CCP/stakeholder range is based on the VECUA submission, [294] the upper bound is based on Origin Energy's submission.[295]

Our implementation of the foundation model approach results in a return on equity of 7.5 per cent and an equity risk premium of 4.55 per cent. This is consistent with equity risk premium ranges from broker reports, valuation reports, other regulators' decisions, and the Wright approach as shown in Figure 3-5.[296] The range of equity risk premium estimates from valuation reports and other regulators' decisions have not materially changed since our preliminary decision. The estimated equity risk premium range from the Wright approach has decreased since our preliminary decision as the risk free rate has increased. As set out in section B.5, we do not agree with the underlying premise of the Wright CAPM that there is a clear inverse relationship between movements in the risk free rate and market risk premium. Consequently we place limited reliance on the Wright approach.

The return on debt material shown in Figure 3-5 does not support any change to our foundation model return on equity estimate. Our foundation model return on equity estimate is about 188 basis points[297] above the prevailing return on debt. The return on debt is a relative indicator and we expect that, most of the time,[298] investors' expected return on equity will exceed the expected return on debt. For our benchmark efficient entity with a similar degree of risk as JEN, we would not expect the return on equity to be a large margin above the prevailing return on debt. [299]

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293 CitiPower, Powercor, United Energy, AusNet Services (distribution), JEN (Vic), ActewAGL, APTNT (Amadeus Gas Pipeline) and AGN.

294 VECUA, *Submission to the AER: AER preliminary 2016–20 revenue determinations for the Victorian DNSPs*, 6 January 2016.

295 Origin Energy, *Submission on ActewAGL's revised access arrangement for 2016–21*, 4 February 2016, p. 3; Origin Energy, *Submission on AGN's revised access arrangement for 2016–21*, February 2016; Origin Energy, *Submission on the AER's preliminary decisions on the Victorian distribution network service providers for 2016–20*, 6 January 2016, p. 3; Origin Energy, *Submission on the Victorian networks' revised proposals (for 2016–21)*, 4 February 2016.

296 For more detail on our consideration of this material, see sections F.2, F.3, F.4, and C.2 respectively.

297 Estimated as the difference between our estimate of the equity risk premium and the prevailing debt risk premium for February 2016.

298 We consider that the expected return on debt is likely to exceed the expected return on equity during periods of financial distress because holders of debt are typically ranked ahead of equity holders in the event of bankruptcy. We also consider that equity and debt may face different types of risk. Inflation risk is one risk that is likely to affect debt more significantly than equity. Movements in the risk premia for these different types of risk may, theoretically, result in an expected return on debt that exceeds an expected return on equity.

299 Due to the regulatory regime and the businesses' monopoly positions shielding them from systematic risk; as well as the measured prevailing debt yields likely overstating the expected return on debt due to default risk. For more information, see section pages 96 to 99 of Attachment 3 to our preliminary decision for JEN.

While the spread between equity and debt premiums has narrowed since the October and November 2015 decisions, it remains above the estimate at the publication of the Guideline in December 2013 (see Figure 3-11 in section E.3). Contrary to the service providers' assertions, we consider the current difference is not too low, given the low risk profile of a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services.[300] Further, measured debt yields likely understate the expected yield spread due to default risk.[301]

The regulatory regime to date has been utilising the Sharpe-Lintner CAPM to set the return on equity and has been supportive of investment. There is no evidence to suggest that the service providers we regulate have not been able to raise capital on reasonable terms to undertake extensive investment programs.[302] This suggests the allowances set in the past using the Sharpe-Lintner CAPM were at least adequate to recover efficient costs.[303] We also note that broker reports suggest that our recent determinations have not removed the ability for listed networks to maintain payment of dividends.[304] This provides confidence that our estimate for this decision, while taking account of the downward trends of equity beta and risk free rate, is likely to provide JEN a reasonable opportunity to recover at least the efficient costs of providing regulated services.

In addition to the equity risk premium ranges shown in Figure 3-5, we have analysed movements in various conditioning variables (yield spreads, dividend yields, and the volatility index for the ASX200).[305] These conditioning variables can provide information about prevailing market conditions and whether or not the market is in a period of heightened risk aversion. Overall, the conditioning variables appear fairly stable and close to their long term averages.

There was broad agreement from consumer groups on the application of our foundation model approach as set out in our Guideline.[306] We consider that this means

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300 Due to the regulatory regime and the businesses' monopoly positions shielding them from systematic risk. For more information, see pages 96 to 99 of Attachment 3 to our preliminary decision for JEN.

301 The debt risk premium to CGS is calculated as the extrapolated effective annual yield to maturity on BBB related debt with 10 years to maturity less the effective annual yield to maturity on CGS with 10 years to maturity. BBB bond yields have been used instead of BBB+ because the RBA and Bloomberg quote BBB yields to maturity.

302 See, for example, DUET, *Successful completion of DUET's $200 million placement offer*, 1 April 2016; DUET, *DUET completes $1.67 billion placement and entitlement offer*, 13 August 2015; DUET, *DUET completes $396.7 million entitlement offer*, December 2014; SP AusNet, *SP AusNet completes A$434 million Entitlement Offer*, 15 June 2012.

303 RARE infrastructure submitted that "[t]here are many characteristics of the Australian Regulatory framework that makes its energy network potentially attractive investments" RARE Infrastructure, Letter to the AER, 13 February 2015.

304 For details, see section L.1 of Confidential Appendix L in Attachment 3 to our preliminary decision.

305 See section E.1, E.2, and E.3 for further discussion.

306 We received submissions from nine consumer groups that provided clear submissions on the approach for estimating the rate of return. No submission opposed the application of our Guideline for estimating the return on equity.

applying the Guideline in its entirety including the overall approach, parameter estimation and use of other information[307] as relevant cross-checks.

In total, eight consumer groups[308] supported our approach and some groups noted that they valued the predictability and transparency resulting from the application of our Guideline and foundation model approach.[309] We note that applying the foundation model approach, as in the Guideline, results in an equity risk premium of 4.55 per cent.

While supporting our Guideline, some consumer groups have submitted that it reflects conservative choices[310] that may result in over-estimating the return on equity and that parameter estimates (and rate of return) can be lowered further.[311] Submissions also

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[307] Broker reports, independent expert reports, other regulators' estimates, comparison with return on debt and our construction of the Wright CAPM.

[308] Origin Energy, *Submission on ActewAGL's revised access arrangement for 2016–21*, 4 February 2016, p. 3; Origin Energy, *Submission on AGN's revised access arrangement for 2016–21*, February 2016; Origin Energy, *Submission on the AER's preliminary decisions on the Victorian distribution network service providers for 2016–20*, 6 January 2016, p. 3; Origin Energy, *Submission on the Victorian networks' revised proposals (for 2016–21*), 4 February 2016; AGL, *Submission on the AER's draft decision on AGN's 2016–21 access arrangement*, 4 February 2016, p. 2; Victorian Government, S*ubmission on the Victorian electricity distribution network service providers' revised regulatory proposals for 2016–20*, 12 February 2016, p. 1–2; CCP (panel 5), *Transmission for the generations: Response to proposal by AusNet Services transmission group pty ltd and AER issues paper for AusNet Services transmission revenue review 2017–22*, February 2016, p. 41; CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 25 February 2016, p. 30; EUCV*, A response to AusNet revenue reset proposal for the 2017–2022 period*, 9 February 2016, p. 40; CCP (panel 8), *Advice to AER from Consumer Challenge Panel sub-panel 8 regarding the AER Daft Decision and Australian Gas Networks' (SA) revised access arrangement 2016–2021 proposal*, 32 March 2016, p. 2.

[309] Origin Energy, *Submission on ActewAGL's revised access arrangement for 2016–21*, 4 February 2016, p. 3; Origin Energy, *Submission on AGN's revised access arrangement for 2016–21*, February 2016; Origin Energy, *Submission on the AER's preliminary decisions on the Victorian distribution network service providers for 2016–20*, 6 January 2016, p. 3; Origin Energy, *Submission on the Victorian networks' revised proposals (for 2016–21)*, 4 February 2016; CCP (panel 5), *Transmission for the generations: Response to proposal by AusNet Services transmission group pty ltd and AER issues paper for AusNet Services transmission revenue review 2017–22*, February 2016;

[310] AGL, *Submission on the AER's draft decision on AGN's 2016–21 access arrangement*, 4 February 2016, p. 2; ECCSA, *A response to the AER draft decision on AGN's AA2016 revenue reset*, February 2016, p. 36; EUCV, *A response to AusNet revenue reset proposal for the 2017–2022 period, 9 February 2016*, p. 40; CCP (panel 5), *Transmission for the generations: Response to proposal by AusNet Services transmission group pty ltd and AER issues paper for AusNet Services transmission revenue review 2017–22*, February 2016, p. 41; VECUA, *Submission on the AER: AER preliminary 2016–20 revenue determinations for the Victorian DNSPs*, 6 January 2016, p. 2; CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 25 February 2016. pp. 10 & 29–30.

[311] ECCSA, *A response to the AER draft decision on AGN's AA2016 revenue reset, February 2016*, p. 36–37; VECUA, *Submission on the AER: AER preliminary 2016–20 revenue determinations for the Victorian DNSPs*, 6 January 2016, p. 2, 12, 17; CCP (panel 5), *Transmission for the generations: Response to proposal by AusNet Services transmission group pty ltd and AER issues paper for AusNet Services transmission revenue review 2017–22*, February 2016, p. 40; CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 25 February 2016, p. 10 & 29.

noted that we need to give more weight to market data and realised returns such as financial performance and asset sales when considering the overall return on equity.[312]

We note the service providers submitted that we did not have appropriate regard to information from other relevant sources. Some stakeholders submitted that we should also have regard to realised returns when considering our overall return on equity estimate. A summary of these submissions and our responses are provided in Table 3-7 below. Having considered the overall information and all material before us, at this time we are not satisfied that this information indicates a departure from the Guideline would contribute to the achievement of the ARORO.

Table 3-7 Issues about overall return on equity cross-checks

Issue	Our response
No reliable inferences can be drawn from the comparison of equity and debt risk premia.[313]	We note that it is difficult to derive definitive conclusions about the level of equity premiums from information on debt premiums as there is inconclusive evidence on the size and strength of any relationship between the two premia.[314] This is why we give this material a directional role.[315] A comparison of the risk premia can indicate if the estimated return on equity is too low (high) relative to the (prevailing) return on debt. Equity investors are residual claimants

[312] VECUA, *Submission on the AER: AER preliminary 2016–20 revenue determinations for the Victorian DNSPs*, 6 January 2016, p. 2, 12, 17; EUCV, *A response to AusNet revenue reset proposal for the 2017–2022 period*, 9 February 2016, pp. 40–41; CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 25 February 2016, p. 10; ECCSA, *A response to the AER draft decision on AGN's AA2016 revenue reset,* February 2016, pp. 36–37.

[313] ActewAGL, *Access arrangement information for the 2016–21 ACT, Queanbeyan and Palerang Access Arrangement, Appendix 8.05: Return on equity – detailed proposal*, June 2015, p. 48.

[314] AER, *Preliminary decision: CitiPower determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, p. 95; AER, *Preliminary decision: Powercor determination 2016 to 2020: Attachment 3 – Rate of return*, November 2015, p. 95; AER, *Draft decision ActewAGL distribution determination 2016 to 2021: Attachment 3 – Rate of return*, November 2015, p. 97; AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 93–96; AER, *Draft decision Australian Gas Networks access arrangement 2016 to 2021–Attachment 3: rate of return*, November 2015, pp. 95–100; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 95–98; AER*, Preliminary decision AusNet Services determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 96–98; AER, *Draft decision Amadeus Gas Pipeline access arrangement 2016 to 2021: Attachment 3–Rate of return*, November 2015, pp. 97–101.

[315] AER, *Better regulation: Explanatory statement–rate of return guideline, December 2013*, p. 61; AER, *Preliminary decision: CitiPower determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, p. 95; AER, *Preliminary decision: Powercor determination 2016 to 2020: Attachment 3 – Rate of return*, November 2015, p. 95; AER, *Draft decision ActewAGL distribution determination 2016 to 2021: Attachment 3 – Rate of return*, November 2015, p. 97 AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, p. 93–96; AER, *Draft decision Australian Gas Networks access arrangement 2016 to 2021–Attachment 3: rate of return*, November 2015, pp. 95–100; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 95–98; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 95–98; AER, *Preliminary decision AusNet Services determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 94–98; AER, *Draft decision Amadeus Gas Pipeline access arrangement 2016 to 2021: Attachment 3–Rate of return*, November 2015, pp. 96–101.

	on a firm's assets in the event of default. It is typically expected, therefore, that equity investments are riskier than debt investments, and that the return on equity should exceed the return on debt.[316] However, we do not expect the equity risk premium for a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services to be significantly higher than the debt risk premium. This is because we consider that there is limited systematic risk associated with JEN's standard control services.[317]
Frontier noted that the comparison between the equity and debt risk premia indicates that they both move inversely to the risk free rate.[318]	We do not consider that the current available evidence supports the view that there is any clear relationship between the risk free rate and risk premia. Frontier submitted evidence of movements in the risk free rate and debt risk premia from only two points in time: November 2014 and October 2015. We do not consider a sample of two data points is sufficiently reliable evidence to alter the results of the comprehensive review of the available evidence by McKenzie & Partington.[319]
Our use of a range of beta estimates from 0.4 to 0.7, instead of our point estimate of 0.7, in the Wright CAPM prevents any real regard being had to the Wright CAPM.[320]	We selected a point estimate of 0.7 from the range of 0.4 to 0.7 partly on considerations of the theoretical underpinnings of the Black CAPM, which is unrelated to the estimation of the Wright specification of the CAPM. To consider evidence from the Wright CAPM independently from our foundation model, we consider it is important to use the equity beta range of 0.4 to 0.7. To do otherwise would reduce the efficacy of using the Wright approach as a check against the foundation model.
We use a range under the Wright approach, whereas Frontier Economics estimates the return on the market under the Wright approach as a point estimate using the longest time period available.[321]	When estimating the Wright approach we estimate a range based on the different averaging periods in Table 3-28. This recognises the estimated return on the market will vary depending on the time period used.[322] This also recognises that each of these periods has merits and limitations (see section C.1.2 in Attachment 3 to our preliminary decision for JEN. This is consistent with the Guideline.[323] We do not consider that JEN has explained why it departed from the Guideline by adopting a point estimate.
Uplifts to market risk premium and risk free rate estimates from broker and valuation reports should be taken into account. [324]	Uplifts applied by brokers and valuers to initial estimates may be inconsistent with the ARORO. They may reflect non-systematic risks, or be designed to account for risks not addressed in cash flow forecasts, or (to the extent there is any) the expectation of outperformance of regulatory allowances. They may also reflect the term structure of the proxies used to estimate the risk free rate and/or market risk premium, the relevant

[316] AER, *Explanatory statement: Rate of return guideline (appendices)*, December 2013, pp. 46–48.

[317] We consider that JEN would be shielded from systematic risk due to reasons such natural monopoly positions and limited demand risk.

[318] Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016, pp. 25–26.

[319] See: McKenzie & Partington, *Report to the AER: relationship between the cost of debt and the cost of equity*, 14 March 2013; Partington, *Report to the AER: Return on Equity (updated)*, April 2015, pp. 72–73.

[320] Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, p. 69.

[321] Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, p. 34.

[322] AER, *Explanatory statement: Rate of return guideline (appendices)*, December 2013, pp. 26–27.

[323] AER, *Explanatory statement: Rate of return guideline (appendices),* December 2013, pp. 37–39.

[324] CitiPower, *Revised regulatory proposal 2016–2020*, pp. 299, 307–308; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 293, 301–302; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 72–74, 83–84; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp.53–54, 61–62; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp, 75–78; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp.

	investment period exceeding the term of the proxies, and the one-off nature of transactions on which they are advising (which differs from our regulatory task where the rate of return is re-assessed for each regulatory control period). As a result, we prefer to have greater regard to estimates exclusive of these uplifts. For more detail, see sections E.3, E.4 and E.6 in Attachment 3 to our preliminary decision for JEN.
Houston Kemp submitted that our concern about uplifts in valuation reports reflecting term structure adjustments is not supported by the evidence.[325]	HoustonKemp has not provided compelling evidence that valuers do not adjust risk free rate estimates to account for term structure. HoustonKemp lists 25 valuation reports that contain a risk free rate estimate that differs from the yield on Australian government securities by at least 100 basis points. HoustonKemp submits that these reports provide no evidence that valuers are considering the term structure of the risk free rate. However, these reports do not provide evidence that valuers are not considering the term structure. Most reports provide little justification for the risk free rate estimate. This is one reason why we have limited reliance on evidence from valuation reports.[326] HoustonKemp refers to a report by KPMG for Prima Biomed. HoustonKemp submits that current yields on Australian government securities do not indicate a step function for forward rates as assumed by KPMG and that KPMG's estimate of 5.5 per cent is above the forward rate. We do not consider this to be a concern. We examine estimates from valuation reports in order to survey the views of other market practitioners. To limit our consideration of only estimates that align with market data would be to make such a survey exercise redundant. HoustonKemp also notes that KPMG estimates cash flows from Prima Biomed to cease before KPMG's estimated step increase in the risk free rate. We acknowledge that more reliance might be placed on KPMG's long-term risk free rate estimate if it had a more material impact, but we do not consider that there is no value in considering KPMG's estimate.
Service providers submitted that the relevant estimates from broker and valuation reports are the imputation-adjusted estimates.[327]	It is not clear that it is necessary to adjust broker and valuer estimates for imputation as it is unclear the extent to which these estimates may be based on third party estimates that already account for the value of imputation credits. There is insufficient information to support any precise adjustment for dividend imputation. The risk premium appropriately reflecting dividend imputation is likely somewhere between the adjusted

67, 76–79; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp.70–74.

325 HoustonKemp, *The cost of equity: Response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 52–59.

326 AER, *Preliminary decision: CitiPower determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 100, 516 & 521–526; AER, *Powercor Preliminary Decision - Attachment 3: Rate of Return*, October 2015, pp. 100, 516 & 521–526;. AER, *Draft decision ActewAGL distribution determination 2016 to 2021: Attachment 3 – Rate of return,* November 2015, p. 101–105, 525–530; AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 99–102, 516–520, 524–537; AER, *Draft decision Australian Gas Networks access arrangement 2016 to 2021–Attachment 3: rate of return*, November 2015, pp. 100–103, 521, 526, 530–544; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 99–102, 516–520, 525–537; ; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 95–98; AER*, Preliminary decision AusNet Services determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 99–102, 522–529; AER, *Draft decision Amadeus Gas Pipeline access arrangement 2016 to 2021: Attachment 3–Rate of return*, November 2015, pp. 524–530; AER, *Explanatory statement: Rate of return guideline (appendices)*, December 2013, pp. 40–42.

327 CitiPower, *Revised regulatory proposal 2016–2020*, pp. 317–321; ; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 311–315; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 96–101; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 71–74; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 75–78 ; JEN (Vic), *2016–20*

	and unadjusted premiums and we take into account both values. For more detail, see sections E.3, E.4 and E.6 in Attachment 3 to our preliminary decision for JEN.
Service providers submitted that it is not appropriate to focus just on the equity risk premium from broker reports.[328]	This submission indicates a misunderstanding of our approach. We clearly have regard to both equity risk premium and overall return on equity estimates from broker reports. For more details see section F.2 of this attachment.
Frontier Economics submitted that we erred in our representation of valuers' estimated market return shown in Figure 3-33 in our preliminary decision.[329]	This submission indicates a misunderstanding of our approach. Valuers' estimates of the market return shown in Figure 3-33 in Attachment 3 to our preliminary decision are calculated as the sum of the valuers' estimated risk free rate and market risk premium.
The EUCV, VECUA and CCP (panel 3) submitted that we should have regard to realised returns estimated from financial statements and asset sales.[330]	Caution must be exercised before drawing inferences about the regulatory rate of return from realised returns. Realised returns may differ from the allowed rate of return due to outperformance of other regulatory allowances, income from unregulated activities, expectations for real growth in the regulatory asset base, or expectations of changes to the regulatory regime or revaluation of the regulatory asset base. Due to these factors, it is unclear what type of relationship may exist between realised returns and the allowed return on equity. That is, it is not clear what alterations to an allowed return on equity would result in an equivalence of regulatory asset values and market values (even if the factors outlined above could be adequately addressed). For this reason, we do not use information from realised returns to estimate the return on equity. For more detail, see pages 102 to 105 of Attachment 3 to our preliminary decision for JEN.

Movements in the risk free rate and the return on equity

Applying our foundation model approach, we estimate a return on equity of 7.5 per cent.

Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs, 6 January 2016, pp. 76–80; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 70–74.

328 CitiPower, *Revised regulatory proposal 2016–2020*, p. 321; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, p. 315; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 100–101; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, p. 74; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, p. 78 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 80; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 73–74.

329 Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016, pp. 19-20.

330 CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 25 February 2016, p. 30; EUCV, *A response to AusNet revenue reset proposal for the 2017–2022 period*, 9 February 2016, p. 40

We consider capital—equity and debt—should provide for a risk premium over a base (risk free) rate. In estimating the allowed rate of return for JEN, we consider the additional riskiness of JEN[331] relative to the risk free asset, and the commensurate risk premium that investors require to take on this additional risk.[332]

The service providers argue that there is an inverse relationship between the risk free rate and market risk premium. It is unclear why this risk premium would increase or decrease to entirely offset changes in the base risk free rate. We have not been provided with compelling evidence that the riskiness of JEN relative to the risk free asset has increased as the risk free rate has decreased. Service providers have not sufficiently explained why, in the absence of an increase in the relative riskiness of JEN, general risk aversion in equity investors would have risen as the risk free rate fell from November 2013, while over the same period it appeared to fall for debt investors. While required returns on equity are not directly observable, we have not been provided with compelling evidence for a clear inverse relationship between the long term forward looking risk free rate and the long term forward looking market risk premium.[333]

We consider that this is consistent with the required return on equity for prevailing market conditions for equity funds for the following reasons:

- We apply the foundation model approach and estimate a return on equity having regard to a range of relevant materials and their relative merits.
- We have regard to the prevailing market conditions for equity funds. We use the dividend growth model and conditioning variables to inform our estimate of the market risk premium. We use other relevant sources of information to cross-check the foundation model estimate. The triangulation of estimates from relevant market participants broadly supports our foundation model estimate of the return on equity.
- Our comparison between the return on equity and return on debt supports the view that our estimated return on equity is not below efficient financing costs[334] under prevailing debt market conditions. We do not consider that the current 188 basis

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331 Or more precisely, a benchmark efficient entity with a similar degree of risk as JEN in respect of the provision of standard control services.

332 In accordance with our task under the NER and NGR. While there may be many various risks associated with providing regulated network or pipeline services, we consider that (consistent with modern portfolio theory) the rate of return will be commensurate with efficient financing costs if it reflects only non-diversifiable risks. Diversifiable risk can be addressed through other regulatory mechanisms, such as capex and opex allowances.

333 For a discussion, see AER, *Explanatory statement to the rate of return guideline (appendices)*, 17 December 2013, pp. 25–26. Also see CEPA, *AER: Victorian gas networks market evidence paper*, February 2013; McKenzie and Partington, *Review of the AER's overall approach to the risk free rate and MRP*, February 2013; Lally, *Review of the AER's methodology*, March 2013.

334 Efficient financing costs for a benchmark efficient entity with a similar degree of risk as that which applies to the distribution network service provider in respect of the provision of standard control services. See: NER, cl. 6.5.2(c); NER, cl. 6A.6.2(c); NGR, r.87(3).

points difference between the equity risk premium allowed in this decision and debt risk premiums[335] to be too low. (see Appendix E.3 for more discussions)

- We do not find conclusive evidence of a relationship between the market risk premium and risk free rate in any direction or size. This is supported by our consideration in the Guideline, previous regulatory decisions and advice from Partington.[336]
- We are not satisfied that there is evidence of a widespread 'flight to quality'[337] among investors in current market conditions that would impact the market risk premium. This can be seen in our consideration of conditioning variables and survey evidence. Further, Partington and the RBA has noted that investors can engage in a 'search for yield' during periods of low interest rate, which can lead to a decrease in the market risk premium expected by investors.[338]

Partington has advised, '[t]he low bond rates tell us that the required return for low risk assets is low'.[339] Partington observed the market rose following the RBA cut to the cash rate on 3 February 2015. While he noted we should be cautious about making inferences based on singular instances, he observed this appeared in line with a fall in required returns. Specifically, he considered:[340]

> Rationally the market went up either because investors expected significant growth in company cash flows, or because their required return went down as a consequence of a lower interest rate. Given that the discussion at the time was about a slowing economy and reduced growth, a fall in required returns seems the more plausible explanation.

More recently, Partington and Satchell considered the submissions put forward by service providers and stated:[341]

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335 The debt risk premiums to CGS are calculated as the extrapolated effective annual yield to maturity on BBB rated debt with 10 years to maturity less the effective annual yield to maturity on CGS with 10 years to maturity). BBB bond yields have been used instead of BBB+ because the RBA quotes BBB yields to maturity.

336 See AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, pp. 104–110; AER, *Access arrangement draft decision: Multinet Gas (DB No. 1) Pty Ltd Multinet Gas (DB No. 2) Pty Ltd 2013–17—Part 2: Attachments*, September 2012, pp. 100–107; AER, *Access arrangement final decision: Multinet Gas (DB No. 1) Pty Ltd Multinet Gas (DB No. 2) Pty Ltd 2013–17—Part 3: Appendices*, March 2013, pp. 31–35; AER, *Access arrangement final decision: APA GasNet Australia (Operations) Pty Ltd 2013–17: Part 3—Appendices*, March 2013, pp. 32–38. AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 270–272.
McKenzie and Partington, *Review of the AER's overall approach to the risk free rate and market risk premium*, February 2013, pp. 6, 24.

337 A 'flight to quality' or 'flight to safety' is usually associated with a view that there is increased risk aversion across the economy and therefore an increased MRP expected by investors.

338 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 72.

339 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 72.

340 Partington, *Report to the AER: Return on equity (updated)*, April 2015, p. 74.

341 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 17.

> There is a possibility that current low interest rates could result in higher equity risk premiums, but we do not think this is likely and more importantly we have seen no convincing evidence that this is the case.

Service providers continue to submit that our estimate of the return on equity is too low as a result of our application of the Sharpe-Lintner CAPM moving in 'lock step' with the risk free rate, based on the following material:

- Dividend growth model estimates
- Wright approach
- Hurdle rates
- Price-to-earnings ratios (PE ratios)
- Independent valuation report

We respond to these materials in the sections below. We note that we have considered much of this material in the preliminary decision[342] and, after reviewing the new materials, our previous considerations remain valid for this decision.

For the reasons outlined, we consider that the foundation model estimate of the return on equity is consistent with the prevailing market conditions in the market for equity funds and the required return on equity for a firm facing similar risks as JEN.

Further, our foundation model approach provides a flexible framework for estimating the required return on equity. It allows the identification of relevant materials and consideration of the roles each piece of material should play for estimating the return on equity. For example, our approach identified the relevant financial models (Sharpe-Lintner CAPM, Black CAPM, dividend growth model and Fama-French model) and, after assessing their merits, uses the theory of the Black CAPM for setting the equity beta estimate and outputs of the dividend growth model for setting the market risk premium estimate. We also consider our foundation model return on equity estimate against a range of other material independent to the foundation model (such as broker and valuation reports). We consider that the service providers have not had appropriate regard to all available evidence, nor a complete consideration of the relative merits of each piece of evidence.

Dividend growth model estimates

Service providers submitted that our estimate of the return on equity is below dividend growth model-based estimates.[343] Frontier submitted that a range of dividend growth

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342 For example, see AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 270–272.

343 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, p. 285; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, p. 219; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 54–56; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 38–40, 51–52; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision:*

model-based estimates of market risk premium and overall return on equity from market practitioners[344] and other regulators[345] supports an inverse, and offsetting, relationship between the risk free rate and the market risk premium.[346]

We assess the dividend growth model in detail in section B.4 and consider that there are a range of limitations with the dividend growth model which makes its results unreliable and unsuitable for estimating the return on equity. We do not consider that any new material has been submitted to us that address the limitations we have identified with dividend growth models. Given these limitations, we do not consider that the dividend growth models provide compelling evidence of an inverse relationship between market risk premium and risk free rate.

Wright approach

Service providers submitted that we have used the Wright approach incorrectly to inform overall return on equity instead the market risk premium.[347] Frontier noted that we do not give material weight to the negative relationship between the risk free rate and the market risk premium that is evidenced by the Wright approach.[348] Frontier also noted that reports by Wright and Smithers and the Economic Regulatory Authority of Western Australia (ERA supported the use of the Wright approach to inform market risk premium and an inverse, and offsetting, relationship between the risk free rate and the market risk premium.[349]

After reviewing all the material submitted to us, we consider that the new materials do not address the previous (and on-going) concerns we have with the Wright approach (see section B.5). Wright and Smithers indicates that the return on the market using

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Attachment 10.26 Response to draft decision: rate of return, January 2016, pp. 45–46, 57–58 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 44–45, 56–58; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp, 39–40, 50–52; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 76–77..

344 A 2014 article from McKinsey and a 2012 article from JP Morgan.

345 A 2014 decision by the Federal Energy Regulatory Commission (FERC) in the United States.

346 Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016, pp. 21–25.

347 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 307, 316; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 301, 310; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 82–83; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, p. 60; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 66 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 66–67; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 59–60; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 66–68.

348 Frontier, *The relationship between government bond yields and the market risk premium*, January 2016, p. 13.

349 Frontier, *The relationship between government bond yields and the market risk premium*, January 2016, p. 14.

U.S. data has been relatively stable over time.[350] However, applying Wright's approach to Australian data, Lally found the estimated market risk premium series is more stable than the average real market return series.[351]

Hurdle rates

McKinsey Inc considered that the required return on equity appeared to be quite stable as government bond yields declined, based on observations of hurdle rates.[352] A hurdle rate is a rate of return that firms and managers use when deciding whether or not to invest in capital projects.

We are not persuaded that hurdle rates provide reliable evidence of the cost of equity for reasons stated in the preliminary decision.[353] The RBA and Deloitte have noted that Australian firms tend to have high 'hurdle rates' of return that are often well above the cost of capital and do not change very often.[354] Further, JP Morgan appears to indicate that hurdle rates may not be responsive to changes in market conditions. This could be because firms use hurdle rates as a capital rationing device,[355] to reflect uncertainty in cash flow forecasts,[356] to reflect strategic incentives,[357] because of an absence of competitive market pressures,[358] or due to immateriality of incremental changes if the firm has a high cost of capital.[359]

Price-to-earnings ratios

We are not satisfied that price-to-earnings ratios provide evidence of an inverse relationship between the risk free rate and the market risk premium in the current market.

If investors reduce their required rate of return, and earnings expectations are unchanged, then market prices and the price-to-earnings ratio should increase.[360]

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350 Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016, pp. 13-14.

351 Lally found the standard deviation of average real market returns is 1.5 per cent. The standard deviation for the average real government bond yield is 1.4 per cent. For the estimate MRP time series, it is 0.9 per cent. These standard deviations imply the average real market return is considerably more volatile than that for the estimated MRP. Lally, *Review of the AER's methodology*, March 2013, pp.12-16.

352 McKinsey, *What effect has quantitative easing had on your share price*,2014, p. 17.

353 See section C.7.2 of Attachment 3 to our preliminary decision for JEN.

354 RBA, *Bulletin - Firms' investment decisions and interest rates*, June quarter 2015.

355 McDonald, *Real options and rules of thumb in capital budgeting*, Oxford University, 2000, p. 1.

356 RBA (Lane and Rosewall), *Bulletin: Firms' investment decisions and interest rates*, June 2015, p. 3; Driver and Temple, *Why do hurdle rates differ from the cost of capital?, Cambridge journal of economics*, 34(3), 2010, p. 516.

357 Driver and Temple, *Why do hurdle rates differ from the cost of capital?, Cambridge journal of economics*, 34(3), 2010, p. 517.

358 Driver and Temple, *Why do hurdle rates differ from the cost of capital?, Cambridge journal of economics*, 34(3), 2010, p. 516.

359 RBA (Lane and Rosewall), *Bulletin: Firms' investment decisions and interest rates*, June 2015, p. 4.

360 Assuming rational, well-functioning markets.

Frontier refers to evidence in McKinsey and JP Morgan reports[361] that price-to-earnings ratios have remained 'within their long-term averages' as risk free rates have recently fallen, and that this suggests investors have not decreased their required rates of return despite a decline in the risk free rate.

However, the McKinsey and JP Morgan reports analysed the US and UK markets, and it is not clear that the Australian market would follow a similar experience. In any case, it is not clear that earnings expectations have remained unchanged as the risk free rate has declined. McKinsey used a one-year-forward price-to-earnings ratio, but market prices likely reflect longer-term expectations, which may differ markedly from one-year forward expectations. JP Morgan acknowledged that the price-to-earnings ratio can also reflect growth expectations.[362] We also note that JP Morgan and McKinsey Inc drew different conclusions on the cost of equity due to using different data periods.

Independent valuation report

Service providers submitted that independent valuation reports provide evidence of an inverse relationship between the risk free rate and the market risk premium.[363] In addition to reports by Incenta and NERA considered in our preliminary decision, a new HoustonKemp report submits that there is a statistically significant inverse relationship between the government bond yield and the market risk premium that is applied by independent expert valuation professionals.[364]

We consider that there is not sufficient evidence to establish the existence of such a relationship in valuers' estimates, because:

- Incenta's sample is too small to support a reliable inference.
- NERA's regression results are driven by its unsupported assumption that any difference between a valuer's stated risk free rate and the prevailing yield on Commonwealth government securities is to be taken as part of their adopted market risk premium.

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361 Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016, p. 21.

362 JP Morgan, *Musings on low cost of debt and high risk premia*, April 2012, p. 2.

363 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 307, 316; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 301, 310; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 73–74, 83–84; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 53–54,61–62; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 67 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 58–59, 67–68; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 53, 70–73.

364 HoustonKemp, *The cost of equity: Response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, pp. xiii–xiv.

As HoustonKemp's analysis uses the same methods to that of NERA, our assessment of NERA's analysis in our preliminary decision are equally applicable to it. These reasons were supported by Partington and Satchell.[365] We do not consider that there is sufficient evidence before us to depart from our original assessment. We respond to this material in more detail in section F.5.

3.4.2 Return on debt

The allowed return on debt provides a service provider with an allowance to cover its borrowing costs associated with funding investments in its network. Consistent with other components of the rate of return, we determine the allowed return by reference to a 'benchmark efficient entity' rather than the actual service provider.

Our decision is to adopt a return on debt of 5.62 per cent, rather than the 7.77 per cent proposed by JEN.[366]

This decision sets out how we arrived at the rate for JEN, and how we plan to update the return on debt in future regulatory years. That is, we set out:

- The return on debt approach. This sets out why we transition the entire return on debt from an on-the-day to a trailing average approach over 10 years (a full transition). While the revised proposals in front of us raised various considerations, most material is on the form of transition to the trailing average approach.
- Implementing the return on debt approach. This includes the benchmark term, benchmark credit rating, our choice and use of third party data series, extrapolation/interpolation issues, contingencies, averaging periods and the annual updating process.

Approach to estimating the return on debt

Our final decision is to transition the entire return on debt[367] from an on-the-day approach in the first regulatory year to a trailing average by updating 10 per cent of the debt portfolio over 10 years (a full transition). This is consistent with the Guideline and our preliminary decision.[368]

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365 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 28; Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 36.

366 JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, 6 January 2016, p. 35.

367 For clarity, that is 100% of the base rate and DRP components of the allowed return on debt.

368 AER, *Better regulation—Explanatory statement to the rate of return guideline*, December 2013, chapters 3, 7 and 8; AER, *Better regulation—Explanatory statement to the rate of return guideline (appendices)*, December 2013, appendix G; AER, *Better regulation—Rate of return guideline*, December 2013, chapters 3,6 and appendix B; AER, *Draft decision—ActewAGL Distribution, Attachment 3: Rate of return*, November 2015, section 3.4.2, and appendices G and I.

In the absence of a transition that substantially eliminates any change in the present value of a benchmark efficient entity as a result of the change in methodology,[369] the only other approach we consider will satisfy the ARORO is the continuation of the on-the-day methodology. The continuation of the on-the-day methodology sets an allowed return commensurate with efficient financing costs at the start of the regulatory control period because it resets the allowed return to the current efficient market rates.

In its revised proposal, JEN proposed an immediate move to a trailing average approach for calculating the allowed return on debt (that is, no transition). As such, it changed its position between its initial and revised proposal, from proposing a hybrid transition to an immediate transition. To support its new position, JEN has provided new material addressing the ARORO and what it requires of us. It only provided this material in its revised proposal. Table 3-8 highlights the difference between the allowed return on debt that service providers proposed in their initial proposals and revised proposals. To see how cash flows differ between our revenue-neutral approach and the service providers' revised proposals, see section of Appendix H.

Table 3-8 shows our final decision return on debt estimates for the first regulatory year (which we consider satisfies the ARORO) are similar to, or higher than, the service providers' initial proposals. As such, the difference between our final decisions and the service providers' revised proposals is almost entirely a result of their change in position between initial and revised proposal.

Table 3-8 Proposed return on debt – first regulatory year[370] (% nominal)*

Service provider	Hybrid transition (most initial proposals)	No transition (revised proposals, preference 1)	Hybrid with 1/3 hedging (most revised proposals, preference 2)	Full transition (AER final decision)
ActewAGL	5.22	7.71	6.88	5.31
AGN	5.40	7.99	7.12	5.51
Amadeus[371]	-	7.69	6.83	5.56
AusNet Services	5.26	7.86	6.99	5.52
CitiPower / Powercor	5.19	7.78	6.92	5.51
JEN	5.28	7.80	6.96	5.62
United Energy	5.57	7.80	7.05	5.62

Source: AER analysis; initial and revised proposals for ActewAGL, AGN, APT Pipelines (Amadeus), AusNet Services, CitiPower, JEN, Powercor and United Energy.

[369] Such as our full transition.

[370] The first regulatory year is 2016 for the Victorian DNSPs and 2016–17 for ActewAGL, AGN and Amadeus. We do not report ActewAGL's interval of delay (2015–16).

[371] APTNT initially proposed a hybrid transition under an assumption that a benchmark efficient entity would have hedged 1/3 of the base rate. APTNT only proposed one option (no transition) in its revised proposal.

* Most service providers used placeholder averaging periods in their proposals. For comparability with our final decision, we have attempted to update each service provider's proposed approach for its final averaging period. Differences between the service providers' proposals and our final decisions may reflect more than the form of transition (for example, service providers used different extrapolation methods, data series and uplifts). Due to the complexities of different approaches, these updated estimates should be regarded as approximations and are used for illustrative purposes only. We do not necessarily accept or agree with the calculations underlying these estimates.

In this section, we:

- set out our overall return on debt approach (that is, the transition to a trailing average)
- set out service providers' proposals and revised proposals on the overall return on debt approach and transition
- explain what approaches to estimating the return on debt can contribute to the ARORO and why (which includes our approach in this final decision)
- explain why none of the approaches in the revised proposals would meet the requirements of the ARORO and NEO/NGO
- set out general problems with using historical data to estimate the allowed return on debt.

Our approach to estimating the return on debt

Our final decision is to start with an on-the-day approach for the first regulatory year and gradually transition into a trailing average approach over 10 years (a full transition).[372] Applied to JEN, this means our return on debt approach is to:

- estimate the return on debt using an on-the-day approach (that is, based on prevailing interest rates near the commencement of the regulatory control period) in the first regulatory year (2016) of the 2016–20 regulatory control period, and
- gradually transition this approach into a trailing average (that is, a moving historical average) over 10 years by annually updating 10 per cent of the return on debt to reflect prevailing market conditions in that year.[373]

In practical terms, our return on debt approach means that an on-the-day approach around the start of the 2016–20 regulatory control period is applied to:

[372] This approach is consistent with the approach we proposed in the Guideline, and have maintained in determination processes since the Guideline. In the Guideline, we based our transition on the approach recommended by the Queensland Treasury Corporation (QTC) (see QTC, *Moving average approach–Detailed design issues*, 8 June 2012). We refer to this as 'the QTC approach'.

[373] This decision determines the return on debt methodology for the 2016–20 regulatory control period. This period covers the first five years of the 10 year transition period. This decision also sets out our intended return on debt methodology for the remaining five years.

- 100 per cent of the debt portfolio in the calculation of the allowed return on debt for the 2016 regulatory year
- 90 per cent of the debt portfolio in the calculation of the allowed return on debt for the 2017 regulatory year, with the remaining 10 per cent updated to reflect prevailing interest rates during JEN's averaging period for 2017. Consistent with the rules requirements, this annual update (and all future annual updates) will be effected through the automatic application of the return on debt methodology we set out in this decision.[374]
- 80 per cent of the debt portfolio in the calculation of the allowed return on debt for the 2018 regulatory year, with 10 per cent based on prevailing interest rates during JEN's averaging period for 2017, and 10 per cent updated to reflect prevailing interest rates during JEN's averaging period for 2018, and
- so on for the subsequent regulatory years.

After the 10 year transition period is complete, the return on debt is a simple average of prevailing interest rates during EN's averaging periods over the previous 10 years (a trailing average).

Initial and revised regulatory proposals

Along with this final decision for JEN, we are making seven constituent final decisions for a range of other service providers.[375] We have considered these proposals together where they put substantially the same views and reasoning forward. It is worth clarifying that, in effect, these service providers are proposing two separate things:

  - to move to a trailing average methodology; and
  - to increase the net present value of their assets (and associated revenues) by proposing to move a trailing average methodology in a manner that is not revenue neutral.

These are separate issues. As long as a revenue-neutral transition is applied, the first issue is not in contention. As such, we predominately respond to the second issue—the form of transition.

It is worth noting that these services providers substantially changed their preferences regarding the form of transition between their initial and revised proposals. To support their change in position, these service providers submitted new material addressing the ARORO and what it requires of us. Further, as part of their revised proposals, the

374 NER cl. 6.5.2(l) and cl. 6A.6.2(l)and NGR, r.87(12). The return on debt methodology for the purposes of the annual update is set out in appendix J of this attachment 3.

375 That is ActewAGL Gas, Amadeus gas pipeline, Australian Gas Networks, AusNet Services, CitiPower, Jemena Electricity Networks and Powercor.

majority of these service providers also proposed a second preference that is also different to their initial proposals.[376] Table 3-9 summarises these proposals.

Table 3-9 Form of transition in initial versus revised proposals

Initial proposals	Revised proposals, first preference	Revised proposals, second preference
Service providers proposed a 'hybrid transition'.[377] This combined a 10 year transition of the base rate into a trailing average approach with a backwards looking trailing average DRP. Their main reason for proposing a hybrid approach was that it would produce an allowed return on debt consistent with these service providers' historically incurred financing costs, which they submitted were efficient. This is because these service providers had been raising debt on a staggered basis, had hedged the base rate to align with the debt allowance, but could not hedge the DRP.[378] Given this, some service providers submitted that compared to a full transition, a hybrid approach would reduce the mismatch between the expected DRP component of the return on debt and the regulatory allowance.[379] We assessed these initial proposals in some detail in the relevant preliminary and draft decisions.[380]	Service providers proposed to immediately adopt a backwards looking trailing average approach. Their reasons for adopting this position include: • An immediate transition is consistent with a historically-based definition of efficient financing costs if immediately implementing a trailing average reduces the ex-post 'mismatch' between the allowed return on debt cash flows and a benchmark efficient entity's actual (historical) debt costs (or cash outflows).[381] • An immediate transition to a trailing average is consistent with outcomes in a workably competitive market because unregulated infrastructure businesses tend to hold staggered debt portfolios. That is, because the intent of legislation is to replicate a workably competitive market, an immediate transition is necessary to replicate the (ex-post) cost outcomes that one would expect absent regulation. [382] This is particularly because incentives created under the on-the-day approach (required under the previously regulatory regime) may	The majority of service providers proposed a second preference for a hybrid transition under partial hedging.[384] This entails only applying a transition to a trailing average to one third of the base rate.[385] Their reasons for this second preference include: • A hybrid transition is consistent with a historically-based definition of efficient financing costs if it reduces the ex-post 'mismatch' between the allowed return on debt cash flows and a benchmark efficient entity's actual (historical) debt costs (or cash outflows).[386] • A benchmark efficient entity would have only hedged one third of the base rate under the on-the-day regime. This is based on CEG's interpretation of the correlation between the base rate and DRP over about 20 years of data.[387]

[376] The exceptions were: APTNT, which only proposed no transition and AGN proposed a full hybrid transition as its third preference.

[377] ActewAGL, *Access arrangement information: Rate of return, gamma and inflation*, June 2015, p. 5; AGN, *Access arrangement information*, July 2015, p. 10; APT Pipelines, *Amadeus Gas Pipeline access arrangement information*, June 2015, p. 29; AusNet Services, *Regulatory proposal*, April 2015, p. 279; CitiPower, *Regulatory proposal*, April 2015, p. 193; JEN, *Regulatory proposal: Attachment 9-2 rate of return proposal*, April 2015, p. 7; Powercor, *Regulatory proposal*, April 2015, p. 201; United Energy, *Regulatory proposal*, April 2015, p. 104.

[378] ActewAGL, *Access arrangement information: Rate of return, gamma and inflation*, June 2015, p. 15; AGN, *Access arrangement information*, July 2015, pp. 174–175; APT Pipelines, *Amadeus Gas Pipeline access arrangement information*, June 2015, p. 29; AusNet Services, *Regulatory proposal*, April 2015, p. 279; CitiPower, *Regulatory proposal*, April 2015, p. 193; JEN, *Regulatory proposal: Attachment 9-2 rate of return proposal*, April 2015, p. 93; Powercor, *Regulatory proposal*, April 2015, p. 201; United Energy, *Regulatory proposal*, April 2015, p. 174.

[379] AusNet Services, *Regulatory proposal*, April 2015, p. 339; CitiPower, *Regulatory proposal*, April 2015, pp. 233–4; Powercor, *Regulatory proposal*, April 2015, pp. 241–2.

[380] See Appendix G of attachment 3 in our preliminary decisions for AusNet Services, CitiPower, Jemena Electricity Networks and Powercor, and United Energy. Also see these sections of our draft decisions for ActewAGL Gas, Amadeus gas pipeline and Australian Gas Networks.

not have resulted in efficient financing practices.[383]

- A benchmark efficient entity is unregulated because an unregulated benchmark efficient entity is consistent with replicating workably competitive market outcomes.

Source: Initial proposals from ActewAGL (June 2015), AGN (July 2015), APT Pipelines (June 2015), AusNet Services (April 2015), CitiPower (April 2015), JEN (April 2015), Powercor (April 2015), United Energy (April 2015). Revised proposals in January 2016 from ActewAGL, AGN, APT Pipelines, AusNet Services, CitiPower, JEN, Powercor, United Energy. AER analysis.

In response to the new positions provided in the revised proposals, we have reconsidered whether our approach to estimating the allowed return on debt would contribute to achieving the ARORO. We maintain our view from the preliminary and draft decisions that a full transition is required to achieve the ARORO. We also consider the ARORO requires we set an ex-ante rate of return that is commensurate with the efficient financing cost of a benchmark efficient entity with a similar degree of risk as the service provider supplying regulated services. We discuss these views and their relation to the return on debt approach in the sections below.

It is also worth noting that this change in service providers' positions results in a notable increase in the allowed return on debt. By proposing to immediately move to a trailing average, service providers have proposed debt allowances varying from 7.7 to

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381 ActewAGL, *Appendix 5.01 detailed response to rate of return, gamma and inflation*, January 2016, p. 33; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 34; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, p. 172; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 341; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 26; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 335.

382 ActewAGL, *Appendix 5.01 detailed response to rate of return, gamma and inflation*, January 2016, p. 4–5,18; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 6; APA Group, *Amadeus Gas Pipeline access arrangement information*, January 2016, p. 24; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, p. 144–5; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 264–5; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. ix–x; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 258–9; United Energy, *2016 to 2020 revised regulatory proposal*, January 2016, p. 76–8.

384 The exceptions were: APTNT, which only proposed no transition and AGN proposed a full hybrid transition as its third preference.

385 In the revised proposals that put Option 5 before us, $x = 1/3$ based on CEG, *Critique of the AER's approach to transition*, January 2016, p. 2.

386 ActewAGL, *Appendix 5.01 detailed response to rate of return, gamma and inflation*, January 2016, p. 33; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 34; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, p. 172; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 341; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 26; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 335.

387 CEG, *Critique of the AER's approach to transition*, January 2016, p. 2; CEG, *Efficient use of interest rate swaps to manage interest rate risk*, June 2015, pp. 64, 91.

383 CEG, *Critique of the AER's approach to transition*, January 2016, p. 1.

7.92 per cent.[388] We consider this would not only exceed the ex-ante efficient financing costs of a benchmark efficient entity, but would also exceed the historical costs of these individual service providers and be inconsistent with the ARORO. The difference in the allowed cash flows between or full transition and no transition is shown algebraically in section of Appendix H.

The CCP3 submits that following this new position to immediately move to a trailing average, service providers are now proposing a higher effective DRP than they would have incurred during the Global Financial Crisis.[389] Following this, we received a number of submissions from stakeholders raising concerns with how the service providers' changed their preferred approach from a hybrid transition to no transition between their initial and revised proposals.[390] Several stakeholders observed that this change notably increases the proposed return on debt even though changes in market conditions do not support this increase.[391] As such, stakeholders found that the service providers' revised proposals requested excessively high allowed returns on debt.[392]

Approaches that contribute to the achievement of the ARORO

We consider the ARORO requires that the allowed rate of return appropriately compensates investors for capital investments (in an ex-ante sense) and aims to minimise the long run cost of capital (all else being equal).[393] We consider ex-ante efficient compensation should result in the ex-ante allowed return on capital cash flows having a present value equal to the present value of the ex-ante efficient cost of capital cash flows required to finance the RAB. This means the allowed return on and of

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388 Service providers proposed allowed return on debts ranging from 7.7% to 7.92%. See ActewAGL, *Access arrangement information*, January 2016, p. 44; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 38; APA Group, *Amadeus Gas Pipeline access arrangement information*, January 2016, p. 24; AusNet Electricity Services, *Revised regulatory proposa*l, January 2016, p. 7-106; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 261; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 35; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 255; United Energy, *2016 to 2020 revised regulatory proposal*, January 2016, p. 75.

389 CCP3 submits that service providers are proposing an effective DRP of approximately 5.1%. In contrast, data suggests that the historical average DRP was in the order of 2.35% for BBB rated companies. Even during the GFC, the DRP was less than 4.5%. See CCP3, *Submission to the AER: An Overview — Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for a revenue reset for the 2016–2020 regulatory period*, 22 February 2016, p. 34.

390 CCP3, *Submission to the AER: An overview — Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs*, 22 February 2016, pp. 30–31; Origin Energy, *Submission on the Victorian networks' revised proposals (for 2016–21)*, 4 February 2016, p. 1.

391 SACOSS, *Submission to the AER in response to AGN's revised proposal for the 2016–2021 access arrangement*, February 2016, p. 10; Minister for Industry, Energy and Resources Victorian Government, *Submission to Victorian distribution businesses revised regulatory proposals (2016–20)*, 29 January 2016, p. 2; Victorian Government, *Submission on the Victorian electricity distribution network service providers' revised regulatory proposals for 2016–20*, 12 February 2016, p.1.

392 CCP3, *Submission to the AER: An overview — Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs*, 22 February 2016, pp. 33–35.

393 By appropriate compensation we mean that the ex-ante return should be commensurate with the expected return in the capital market for an investment with a similar degree of risk as that of a benchmark efficient entity in the position of the service provider supplying regulated services.

capital cash flows should have a present value equal to the statutory value of the RAB. This is a zero NPV investment condition, as discussed in section 3.3.3.[394]

A rate of return that achieves the ARORO should also be consistent with the RPPs in the NEL/NGL, which indicate a service provider should be provided with a reasonable opportunity to recover at least efficient costs. These also require that we should provide regulated firms with effective incentives to promote economic efficiency and have regard to the economic costs and risk of the potential for service providers to under- or over-invest.[395]

We have formed our view that our decision to estimate the allowed return on debt by starting with an on-the-day approach for the first regulatory year and gradually transitioning into a trailing average approach over 10 years will result in an allowed return on debt that contributes to the achievement of the ARORO. The other option that we consider would achieve the ARORO is maintaining the on-the-day approach. Related to this, all else being equal, a trailing average (with transition) and on-the-day approach provide equivalent ex-ante compensation over the term of the RAB (see Appendix H for a detailed discussion). We consider this position is consistent with the AEMC's observations about SFG's view:[396]

> SFG highlighted that for a given definition of the return on debt for an efficient benchmark service provider (in particular, the assumed credit rating and term to maturity) the average cost of debt will be the same over the long run. This is regardless of whether the return on debt estimate is based on the prevailing debt cost spot rate or an average of that spot rate. Changing to an averaging approach will not, in itself, systematically reduce or increase the allowed return on debt in the long run.

Trailing average (with full transition) meets the ARORO

With a full transition, a trailing average approach would provide a benchmark efficient entity with a reasonable opportunity to recover at least efficient costs over the term of the RAB. It could therefore result in an allowed return on debt (and overall rate of return) that can be consistent with the rules and NEL/NGL. Appendix H provides detailed reasons, including a mathematic description, for why this holds. Further, regarding adopting a trailing average approach more broadly:

- Compared to an on-the-day approach, a trailing average approach will lead to less volatile cash flows.[397]
- Some stakeholders submitted that a trailing average would reduce some of the risks faced by service providers, which would eventually flow to lower betas than

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[394] See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 14.

[395] For the RPPs see NEL, s. 7A; NGL, s. 24.

[396] AEMC, *Final Rule Determination: Economic regulation of network service providers, and price and revenue regulation of gas services*, 29 November 2012, pp. 74–75.

[397] AER, *Explanatory statement to the rate of return guideline (Appendices)*, December 2013, p. 38.

what we have historically seen.[398] Frontier also advised that a trailing average approach would result in a smooth profile for the allowed return on debt.[399]

- A trailing average approach received broad stakeholder support.[400]

We consider the on-the-day approach could contribute to the achievement of the ARORO and is therefore open to us (see the following section). On this basis, the present value of a benchmark efficient entity's allowed revenues under the on-the-day approach would have been sufficient to compensate it for its efficient financing costs. That is, a benchmark efficient entity would not have been under- or over-valued when we calculated its debt allowance under the on-the-day approach, and continuing this approach will continue to provide correct compensation commensurate with efficient financing costs.

If this holds, then changing the present value of a benchmark efficient entity would result in overcompensation (if we increase its value) or undercompensation (if we decrease its value). This would not meet the ARORO or be consistent with achieving the NEO/NGO. As such, changing debt estimation methodologies must be revenue-neutral (in a present value sense) to avoid incorrectly compensating a benchmark efficient entity relative to its efficient financing costs.

Switching immediately from an on-the-day approach to a trailing average approach could only be revenue-neutral by chance. Specifically, this could occur if the average cost of debt over the last nine years equalled the current cost of debt in the market. However, if the nine year average was higher (lower) than the current cost of debt, then changing approaches would increase (decrease) the present value of the benchmark efficient entity. This arises because the allowed return on debt is estimated using prevailing market data under the on-the-day approach and historical market data under the trailing average approach. As such, by construction, these two approaches will typically produce different estimates at given points in time.

For this reason, we have used our transition approach because it is approximately revenue neutral (in a present value sense).[401] That is, it aims to assist us in switching between methodologies to estimating the return on debt without changing the present value of a benchmark efficient entity's allowed revenues purely due to this switch. HoustonKemp provided support for a transition to avoid such changes to the present value of a benchmark efficient entity's allowed revenues and to limit 'regulatory risk' in

[398] MEU, *Submission to beta issues paper*, October 2013, p. 5; PIAC, *Submission to beta issues paper*, October 2013, pp. 6–7, 9–10.

[399] Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 74.

[400] AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 108–111.

[401] Only a full transition is revenue neutral of the different transition paths before us. However, there are other possible revenue paths that are revenue neutral (in a present value sense) from the change in methodology. For example, this could include a lump sum transfer (see Appendix H).

its advice to ESCOSA.[402] We also note that SFG advised the AEMC that the type of transition mechanism we apply in this final decision would be effective:[403]

> The type of "rolling in" arrangement [transition] that has been proposed by QTC [the full transition we adopted] would be an effective means of transitioning from the current Rules to the use of an historical average cost of debt approach

For completeness, changing approaches once from an on-the-day to a trailing average approach will only require one revenue neutral transition. If there was good reason to later readopt an on-the-day approach (or adopt an alternative approach that could also contribute to meeting the ARORO), this would require another once-off revenue-neutral transition. We consider this is consistent with the rules requirement to have regard to any impacts on a benchmark efficient entity referred to in the ARORO that could arise from a change of methodology.[404] The AEMC explained that the purpose of this aspect of the rules was:[405]

> for the regulator to have regard to impacts of changes in the methodology for estimating the return on debt from one regulatory control period to another. Consideration should be given to the potential for consumers and service providers to face a significant and unexpected change in costs or prices that may have negative effects on confidence in the predictability of the regulatory arrangements.

Continuing the on-the-day approach meets the ARORO

An on-the-day approach provides service providers with a reasonable opportunity to recover at least efficient costs over the term of the RAB <u>and</u> over each regulatory control period. Appendix H provides detailed reasons, including a mathematic description, for why this holds. On this basis, we consider continuing the on-the-day approach for estimating the allowed return on debt will achieve the ARORO and the NEO.[406] Further, as Table 3-10 shows, we consider that neither an on-the-day nor trailing average approach would be clearly superior to the other. Rather, each of these approaches has its own benefits and limitations

Given this, while we adopt a trailing average for this determination, we do not consider this change in methodology would be justified in the absence of a transition. Without a transition, the change to the trailing average would not be revenue neutral, but would rather increase the present value of a benchmark efficient entity's allowed revenues

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402 HoustonKemp, *Appropriate objective to guide the setting the cost of debt allowance*, March 2015, p. 5.

403 SFG, *Rule change proposals relating to the debt component of the regulatory rate of return*, August 2012, p. 46.

404 NER, cl. 6.5.3(k)(4), states '(k) In estimating the return on debt under paragraph (h), regard must be had to the following factors… (4) any impacts (including in relation to the costs of servicing debt across regulatory control periods) on a benchmark efficient entity referred to in the allowed rate of return objective that could arise as a result of changing the methodology that is used to estimate the return on debt from one regulatory control period to the next'. Also see NER, cl. 6A.6.2 (k) (4); NGR, cl. 87(12) (d).

405 AEMC, *Final Rule Determination: Economic regulation of network service providers, and price and revenue regulation of gas services*, 29 Nov ember 2012, p. 85.

406 As required under NER, cl. 5.5.2(h); NER, cl. 6A.6.2(h); NGR, cl. 87(8).

purely due to changing the debt estimation methodology (see the subsequent section). Consequently, in the absence of a transition, we would not consider a trailing approach will achieve the ARORO and we would instead maintain the on-the-day approach to estimating the return on debt.

Table 3-10: Benefits of different debt approaches

Benefits of a trailing average approach	Benefits of an on-the-day approach
A trailing average approach provides service providers with a regulatory benchmark that they can more readily match each regulatory control period.[407] As such, this provides a benchmark efficient entity with an enhanced opportunity to minimise any mismatch between actual costs and regulated revenues.[408] Nevertheless, it is important to note that this mismatch risk would not result in a benchmark efficient entity being ex-ante over- or under-compensated for its efficient debt financing costs for a regulatory control period or over the life of its assets. All else being equal, this reduced risk and the reduced need to enter hedging arrangements might lower the efficient cost of financing for a benchmark efficient entity and increase productive efficiency. A trailing average is likely to provide for a smoother price path than the on-the-day approach. Regulatory revenues adjust gradually to movements in interest rates. By contrast, the on-the-day approach can lead to large shifts in revenue at each reset if underlying interest rates have moved since the last reset.	An on-the-day approach better reflects the prevailing cost of debt in the capital market near the commencement of the regulatory control period. Due to this, it: • Better reflects investors' opportunity cost of debt and expectations of future returns near the commencement of the regulatory control period.[409] It therefore provides a better signal for efficient investment decisions that increase dynamic efficiency. This is consistent with the AEMC's view that the return on debt framework should minimise the risk of creating distortions in service providers' investment decisions:[410] • Is more internally consistent with how we estimate other components of the allowed rate of return and the building block model more generally. • Leads to an estimate that is commensurate with efficient financing costs and competitive market outcomes near the commencement of the regulatory control period. We expect prevailing market rates for capital finance to be competitive.[411] Moreover, a return on debt that reflects the current market rate more closely imitates the outcomes of a competitive market by representing the costs that other service providers will face to enter the market.[412]

Source: AER analysis.

Revised proposals will not contribute to the achievement of the ARORO

We have carefully considered the transition paths to the trailing average put forward in the revised proposals. These paths include:

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407 See AER, *Final decision: TransGrid transmission determination, Attachment 3*, April 2015, p. 150.

408 HoustonKemp, *Memo: Appropriate objective to guide the setting of the cost of debt allowance*, 3 March 2015, p. 4.

409 Peirson, Brown, Easton, Howard, Pinder, *Business Finance*, McGraw-Hill, Ed. 10, 2009, pp. 427, 434.

410 AEMC, *Final Rule Determination: Economic regulation of network service providers, and price and revenue regulation of gas services*, 29 November 2012, p. 73.

411 Kahn, A.E., 'The economics of regulation: Principles and institutions', The MIT Press, Massachusetts, 1988, p. 45.

412 In a competitive market, prices are theoretically constrained by entry or the threat of entry. See HoustonKemp, *Memo: Appropriate objective to guide the setting of the cost of debt allowance*, 3 March 2015, p. 1. This is also implied in Chairmont, *Cost of debt comparative analysis*, November 2013, p. 4.

- No transition (or an immediate move) to a trailing average—Adopt a backwards looking trailing average approach (no transition on either the base rate or DRP components of the return on debt).
- Hybrid transition—Start with an on-the-day approach for the base rate component and gradually transition into a trailing average approach over 10 years. This would be combined with a backwards looking trailing average DRP (that is, a base rate transition only).
- Hybrid transition under partial hedging—Assume a benchmark efficient entity hedged only one third of the base rate under the on-the-day regime on the basis that this would have been ex-post optimal.[413] Gradually transition this portion of the base rate and apply an immediate trailing average to the other two thirds of the base rate and the entire DRP component.[414]

The following sections set out why neither of these transition paths would contribute to the achievement of the ARORO.

Immediate transition will not contribute to the achievement of the ARORO

For the reasons discussed above under, 'trailing average (with full transition) meets the ARORO', immediately moving to a trailing average by immediately adopting a historical cost of debt is likely to change the present value of a benchmark efficient entity's allowed revenues relative to a continuation of the on-the-day approach.

The current market cost of debt is considerably below the average market cost of debt over the past nine years. As such, in current circumstances, an immediate transition would lead to an excess positive return relative to the efficient return in the market. All else being equal, this will result in a material increase in the present value of a benchmark efficient entity's allowed revenues relative to its expected efficient costs to a value well above its RAB, thereby overcompensating it. Service providers have not submitted material that satisfies us that materially increasing the present value of their allowed revenues from the change in methodology would contribute to the achievement of the ARORO or be consistent with the NEL/NGL.

It is worth noting that equally, the trend in interest rates could have been reversed (that is, if we had moved from a low to high interest rate environment). If this occurred, an immediate transition would have led to a material decrease in the present value of a benchmark efficient entity's allowed revenues relative to its expected efficient costs, thereby undercompensating it. That is, the allowed return would have been below the

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413 ActewAGL, *Access arrangement information*, January 2016, p. 35; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 3; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, p. 7-33; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 266; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 28; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 260; United Energy, *2016 to 2020 revised regulatory proposal*, January 2016, p. 79.

414 In the revised proposals that put Option 5 before us, $x = 1/3$ based on CEG, *Critique of the AER's approach to transition*, January 2016, p. 2.

efficient financing costs of a benchmark efficient entity. Neither outcome would achieve the ARORO and would not lead to efficient investment and use of infrastructure, in the long term interest of consumers. We explain this and show this mathematically in detail in Appendix H.

Further, we consider that failing to implement a revenue neutral transition would undermine the ARORO and the NEL/NGL for the following reasons:

- The future return on debt allowance would have a different present value if we switched methodologies to estimating the allowed return on debt without a transition. In Appendix H, we establish that continuing the on-the-day approach would satisfy the ARORO. Given this, changing approaches must be revenue neutral or it would either over- or under-compensate a benchmark efficient entity for its efficient debt financing costs. We do not consider this outcome contributes to the achievement of the ARORO, NEO/NGO or RPPs.
- If switching to a trailing average approach is not revenue neutral, this would change the present value of a benchmark efficient entity's expected regulated cash flows compared to the value of the expected cash flows that would be consistent with the investor expectations when they invested (under the on-the-day approach). This may increase expected regulatory uncertainty. This may undermine confidence in the predictability of the regulatory arrangements and lead to an inefficient increase in financing costs (all else being equal).[415] This is consistent with SFG's advice to the AEMC that:[416]

  > The lack of any transition arrangements in a setting whether the rule change exposes regulated businesses to risks that they did not previously face is likely to be viewed by the market for funds as a signal that a higher degree of regulatory risk should be priced into their provision of funds. Such an outcome is unlikely to be consistent with the NEO and RPP.

- Incentives on service providers to adopt efficient financing practices (and thereby minimise their long run cost of capital all else being equal) under the regulatory regime may be undermined.[417] For instance, by allowing service providers to bear the consequences (or reap the benefits) of their actions from prior regulatory control periods, this incentivises them to efficiently manage financial risk.

Hybrid transitions will not contribute to the achievement of the ARORO

As Table 3-11 highlights, both hybrid transitions are effectively different combinations of a 'full transition' and 'no transition'. On the basis that a full transition contributes to the achievement of the ARORO and no transition fails to achieve this, then both hybrid transitions would fail to achieve the ARORO. For this reason, our analysis above on

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415 See HoustonKemp, *Appropriate objective to guide the setting of the cost of debt allowance*, 3 March 2015, p. 5; Expert Panel on Energy Access Pricing, *Report to the Ministerial Council on Energy*, April 2006, p. 59.

416 SFG, *Rule change proposals relating to the debt component of the regulatory rate of* return, August 2012, p. 46.

417 The RPPs require we have regard to this effect on incentives. See NEL, s7A(3)(b); NGL, s24(3)(b).

why immediately moving to a trailing average approach will not contribute to the achievement of the ARORO also applies to the hybrid transitions that service providers have proposed.

Table 3-11 Different transitions to a trailing average

Form of transition	Revenue-neutral transition by updating 10% per year over 10 years	Immediately move to a trailing average approach
Full transition	100% of base rate + DRP	-
Hybrid transition	100% of base rate	DRP
Hybrid transition under partial hedging	1/3 of base rate	2/3 of base rate + DRP
No transition	-	100% of base rate + DRP

Source: AER analysis.

For clarity, we also emphasise why the logic underpinning the use of a hybrid transition is problematic. By basing service providers' debt allowance on a 10 year historical DRP, a hybrid transition effectively removes realised losses or gains from interest rate risk that they had previously borne. This reasoning also applies to an immediate transition.

As the services providers operate under an ex-ante regulatory regime, we consider the ARORO requires us to provide ex-ante efficient compensation. This does not entail compensating for historically incurred costs. That would be cost of service regulation, not incentive regulation. Investors have invested accepting the interest rate risk from the on-the-day approach, and we have already appropriately compensated service providers for bearing this risk. For both reasons, removing the outcomes of this risk ex-post would not contribute to the achievement of the ARORO.[418]

Further, we consider that we have appropriately compensated investors for the risks they faced when we set the allowed return on debt using the on-the-day approach. This is because:

- We have set the allowed return on debt using the on-the-day approach for many years.[419] As such, when we applied the on-the-day approach, investors in a benchmark efficient entity would have expected us to reset the return on debt at the start of each regulatory control period and accepted any risks associated with this approach. When we proposed moving to a trailing average in the Guideline, this proposal was contingent on applying a transition so that the value of the firm aligned with previous investor expectations under the on-the-day regime.

[418] Lally, *Review of submissions on the cost of debt*, 21 April 2015, p. 25.

[419] We have used the on-the-day approach to estimate the return on debt since 1998 where we interpreted our task as requiring us to derive a rate of return that was as up to date as possible at the time the access arrangement came into effect. See ACCC, *Victorian Gas Transmission Access Arrangements Final Decision*, 6 October 1998, p. 49.

- We benchmark the allowed rate of return (which requires consistently benchmarking the return on debt, return on equity and gearing) on observed data from service providers comparable to a benchmark efficient entity operating under an on-the-day approach. Therefore, the allowed rate of return should be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as a regulated service provider operating under this approach.[420]

Further, regarding the reasoning put forward for a hybrid transition under partial hedging, we consider a full transition necessary to satisfy the ARORO and NEO/NGO even if firms partially hedged. It is also worth noting that service providers did not appear to hold the view that hedging one third of the base rate was optimal ex-ante because they appeared to have hedged nearly their entire base rate in practice.[421]

General problems with using approaches based on historical data

Both the immediate and hybrid forms of transition to the trailing average rely on using historical data to estimate the allowed return on debt. We consider this has the following problems:

- All of these transition paths would produce a return on debt allowance that effectively removes interest rate risk (to at least some extent) incurred in prior regulatory control periods. A benchmark efficient entity was required to bear and manage this risk under the on-the-day approach. As such, these transition paths alter the service providers' historic risk profiles <u>after</u> they have made decisions on how to manage their financial risk.
- Choosing an approach that uses historical data after parties already know the results of that historical data has the potential to bias regulatory decisions. In our recent preliminary decisions, we explained that when parties (whether they be service providers, the Tribunal, or ourselves) choose historical averaging periods, the knowledge of the return on debt at any past point may influence the choice.[422] For example, if a service provider could select an averaging period by looking at historical yields, it could introduce an upward bias.[423] This is one of the reasons why, when recommending a gradual transition into the trailing average approach, QTC stated:

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[420] In particular, to the extent that the financial risks (including interest rate risk) arising from the on-the-day approach are systematic, they would be priced into investors' required return on equity. This would be compensated for in our equity beta estimate, which is calculated based on historical returns.

[421] APA Group, *Annual report 2015*, p. 14; DUET Group, *Financial report for year ended 30 June 2015* , p. 61; Envestra Ltd, *Directors' and financial report*, 30 June 2014, p. 27; Spark Infrastructure, *Annual report 2012*, p. 16; SP AusNet, *Business review 2014: SP AusNet Distribution financial report*, Note 19, p. 11. Spark Infrastructure cancelled its interest rate swaps in 2013. See Spark Infrastructure, *Annual Report 2013*, p. 16.

[422] For example, see AER, *Preliminary decision—CitiPower determination, Attachment 3: Rate of return*, October 2015, pp. 190–2. Also see AER, *Explanatory statement to the rate of return guideline*, December 2013, p. 166.

[423] Lally, M., *Expert Report of Martin Thomas Lally*, 13 February 2011, pp. 9–10.

> The transitional rule ensures that the NSP is not able to receive a higher initial rate simply by electing to use the moving average approach. It also avoids the need to reach agreement on the return on debt calculation for each of the preceding nine years.[424]

- In our preliminary decision, we observed there are practical problems with using historical data dating back nine years.[425] In particular, high quality and readily available historical data is unavailable for the DRP component of the return on debt.[426] There is also no consensus among service providers on how to estimate the historical debt risk premium. Moreover, the results of the different data series vary considerably with Lally observing:[427]

> there has been considerable variation in the results from four such indexes since early 2007, most particularly in early 2009 when the estimates of the RBA, CBA Spectrum, and BFV indexes were 9.5%, 5.0% and 3.5% respectively (CEG, 2014, Figure 1); this variation complicates the process of choosing estimates for that historical period.

Implementing the return on debt approach

In the previous section, we set out our approach to estimating the allowed return on debt. This approach involves estimating an on-the-day rate (i.e. based on prevailing market conditions) in the first regulatory year of the new period. It also involves gradually transitioning this rate into a trailing average approach (i.e. a moving historical average) over 10 years. This gradual transition will occur through updating 10 per cent of the allowed return on debt each year to reflect prevailing market conditions during the particular service provider's averaging period for that year.

In this section, we set out our considerations on the implementation issues associated with estimating the allowed return on debt approach. These issues are:

- the term of debt issued by a benchmark efficient entity
- the credit rating of a benchmark efficient entity
- whether to use an independent third party data series or to construct our own data series (for example, based on an index of actual industry borrowing costs)

[424] QTC, *Moving average approach–Detailed design issues*, 8 June 2012.

[425] For example, see AER, *Preliminary decision—Jemena distribution determination, Attachment 3: Rate of return*, October 2015, pp. 196–9. Also see AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 166–7.

[426] No third party data series is available for the full 10 year historical period, meaning a mixture of data series for different time periods would be required. The RBA and Bloomberg (BVAL) data series commenced in January 2005 and April 2010 respectively. The Commonwealth Bank of Australia Spectrum and Bloomberg fair value curve data series ceased publication in August 2010 and May 2014 respectively.

[427] Lally, M., *Transitional arrangements for the cost of debt*, November 2014, p. 15.

- the choice of third party data series (or combination of data series) to estimate the efficient debt financing costs of a benchmark efficient entity, based on the benchmark debt term and benchmark credit rating
- extrapolation and interpolation issues with adjusting our choice of data series
- contingencies associated with implementing our choice of data series, if the data series we have chosen to estimate the return on debt are unavailable or change in future regulatory years during the regulatory control period
- the new issue premium
- the averaging period used to estimate the return on debt for each regulatory year,
- the annual process to update the return on debt.

Consistent with the Guideline, we are satisfied that a return on debt estimated based on a 10 year benchmark debt term, BBB+ benchmark credit rating, and using an independent third party data series is commensurate with the efficient financing costs of a benchmark efficient entity.

In choosing that third party series (or combination of series), we are satisfied that adopting a simple average of the broad BBB rated RBA and Bloomberg Valuation Service (BVAL) curves, with the RBA data series extrapolated to a 10 year term, is commensurate with the efficient financing costs of a benchmark efficient entity.

Term

Our decision is to adopt a ten year term for the return on debt. This is consistent with the Guideline.[428] This is also the position we adopted in our preliminary decision for JEN.[429]

All service providers with revised proposals currently before us proposed a ten year term for the return on debt.[430] This is consistent with their initial regulatory proposals.[431]

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[428] AER, *Better regulation—Rate of return guideline*, December 2013, p. 21; AER, *Better regulation—Explanatory statement to the rate of return guideline*, December 2013, pp. 135–147.

[429] AER, *Preliminary decision: Jemena distribution determination 2016 to 2020, Attachment 3—Rate of return*, October 2015, pp. 210–214.

[430] ActewAGL, *Access arrangement information*, January 2016, p. 15; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 7; APTNT, *Amadeus Gas Pipeline access arrangement information*, January 2016, p. 24; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, p. 7-5; CitiPower, *Revised Regulatory Proposal 2016—2020*, 6anuary 2016, p. 262; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. xi; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 256; United Energy, *2016 to 2020 revised regulatory proposal*, January 2016, p. 79.

[431] ActewAGL, *Initial proposal—Appendix 8.01: Detailed return on debt proposal*, June 2015, pp. 1,6; AGN, *Initial proposal—Attachment 10.1: Rate of return*, July 2015, pp. 51–52; APTNT, *Initial proposal—Access arrangement information*, August 2015, pp. 28–33; AusNet Services, *Initial regulatory proposal,* April 2015, pp. 335–336; Citipower, *Initial regulatory proposal*, April 2015, p. 227; JEN, *Initial regulatory proposal—Attachment 9.2: Rate of return proposal,* April 2015, pp. 88–89; Powercor, *Initial regulatory proposal*, April 2015, pp. 235-236; United Energy, *Initial regulatory proposal—Attachment: Rate of return on debt*, April 2015, pp. 4–6.

This position is also consistent with advice from NERA and CEG (commissioned by service providers in recent regulatory processes).[432]

However, the Consumer Challenge Panel (CCP) has submitted that a seven year term is more suitable given our evidence on the weighted average bond tenor of service providers.[433] Recently, CCP subpanel three (CCP3) characterised this as one 'conservative decision' in a series of conservative decisions that would have the cumulative effect of a consistently overestimating the allowed rate of return.[434] Our view on this submission is:

- We agree that our decision to adopt a 10 year term for the return on debt could be characterised as 'conservative' given this is more likely to overstate rather than understate the debt term of a benchmark efficient entity.[435] It is worth noting that some service providers have previously submitted that they did not agree this assessment.[436] We responded to these submissions in our most recent preliminary decisions and reinforced our finding that the industry average term for the return on debt is 8.7 years.[437] While several of the revised proposals currently before us reiterated this disagreement, these did not provide new supporting information.[438] As such, we have no reason to depart from our positon or reasons in our most recent preliminary decisions.
- We do not agree that our decision has the cumulative effect of a consistently overestimating the allowed rate of return. We are cognisant that the overall rate of return must be determined such that it achieves the ARORO.[439] As such, in forming this decision, we have considered the allowed rate of return holistically and have taken into account interrelationships between parameters (see section 3.6.3). Having done this, we are satisfied that our allowed rate of return achieves the ARORO.

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432 NERA, *Return on capital of a regulated electricity network,* May 2014, p. ii; CEG*, WACC estimates, a report for NSW DNSPs*. May 2014, pp. 48–49.

433 CCP, *Bruce Mountain: Comments on the AER's Preliminary Decision on the Weighted Average Cost of Capital (WACC) for Energex, Ergon and SA Power Networks,* July 2015, p. 8*.*

434 CCP3, *Submission to the AER: An Overview — Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for a revenue reset for the 2016-2020 regulatory period*, 22 February 2016, p. 29

435 We have recognised this previously in our preliminary decisions. See AER, *Preliminary decision: Jemena distribution determination 2016 to 2020, Attachment 3—Rate of return*, October 2015, pp. 210–211.

436 For example, SAPN did not agree that the true benchmark debt term would likely to less than 10 years. SAPN, *Revised regulatory proposal*, June 2015, p. 381.

437 See for example, AER, *Preliminary decision: Jemena distribution determination 2016 to 2020, Attachment 3—Rate of return*, October 2015, pp. 210–214.

438 ActewAGL, *Access arrangement information*, January 2016, p. 36; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 36; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, p. 175; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 344; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 29; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 338. These service providers referenced a report considered during the Guideline development process. That is, PwC, ENA: *Benchmark term of debt assumption*, June 2013.

439 NER, cl. 6.5.2(b); NGR, r. 87(2).

We are satisfied that measuring the allowed return on debt by reference to a 10 year benchmark term is commensurate with the efficient financing costs of a benchmark efficient entity. Our reasons for adopting a 10 year benchmark debt term are:

- A long debt tenor is consistent with the long lived assets of a benchmark efficient entity and reduces refinancing risk.
- A 10 year term is similar to (though somewhat longer than) the industry average term at issuance of a sample of firms that are comparable to the benchmark efficient entity.

Regulated network assets are long lived, and have asset lives that are longer than the terms commonly available for debt. Refinancing risk is the risk that a firm would not be able to refinance its debt at a given point in time due to this mismatch in terms. While conceptually we agree that businesses will seek to issue longer term debt to lower their refinancing risk, generally the cost of long term debt is higher than shorter term debt. This is because debt holders require compensation for the risks associated with holding debt over a longer time period. We consider a benchmark efficient entity would have regard to the trade-off between the higher cost of long term debt and the risk associated with refinancing and structure their debt holdings accordingly. Overall, these considerations suggest the average debt term of a benchmark efficient entity would be long term, but they do not provide clear guidance on what exactly that term should be.

For that reason, in our Guideline, we requested information from a range of privately owned service providers on the amount, type, term and credit rating of their debt issuances.[440] These service providers are comparable to our definition of the benchmark efficient entity which is a 'pure play' regulated energy network business operating within Australia. Based on observed practice, the weighted average term at issuance of the debt portfolio of these service providers was 8.7 years at the time of the Guideline. We observed that service providers are securing bank debt with an average term at issuance of 4.3 years, issuing Australian bonds with an average term at issuance of 9.6 years, and issuing offshore bonds with an average term of 9.7 years.[441]

Credit rating

Our final decision is to adopt a BBB+ credit rating to estimate the return on debt. This credit rating is the same rating we proposed in the Guideline and applied in our

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440 Information was received from APA Group, AusNet Services, CitiPower, Dampier to Bunbury Pipeline, ElectraNet, Envestra, Jemena, Multinet, Powercor, SA Power Networks and United Energy.

441 AER, *Better regulation—Explanatory statement to the rate of return guideline*, December 2013, p. 136.

preliminary decision.[442] We also applied this credit rating to recent decisions that were upheld before the Tribunal.[443]

In current regulatory processes, different service providers, consultants and other stakeholders have proposed different credit ratings for the benchmark efficient entity. In particular:

- CitiPower, Powercor, AusNet Services distribution and ActewAGL proposed a credit rating of BBB to BBB+.[444]
- Jemena and AGN accepted our benchmark credit rating of BBB+, but submitted that the evidence supported a BBB to BBB+ credit rating.[445]
- United Energy and AusNet Services transmission submitted a BBB rating.[446] APT Pipelines (NT) Pty Ltd initially submitted a BBB rating, but did not address benchmark credit rating in its revised proposal.[447]
- Powerlink transmission and TasNetworks distribution applied the BBB+ credit rating in the Guideline.[448]

Service providers with revised proposals currently before us did not submit any new consultant reports on the benchmark credit rating. However, the consultant reports we received previously were mixed. For instance:

- NERA and Houston Kemp (commissioned by TransGrid in a recent regulatory process) recommended a BBB+ credit rating.[449]
- Several service providers and CEG (commissioned by several service providers) recommended a BBB credit rating.[450]

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442 AER, *Better regulation—Rate of return guideline*, December 2013, p.21; AER, *Better regulation—Explanatory statement to the rate of return guideline*, December 2013, pp.152–157; AER, *Preliminary decision Jemena distribution determination - Attachment 3 - Rate of return*, October 2015, p. 214.

443 Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, para 993.

444 AusNet Services, *Revised Proposal*, January 2016, pp. 7–5; CitiPower, *Revised proposal 2016-20*, January 2016, p. 328; Powercor, *Revised Regulatory Proposal*, 2016-2020, January 2016, p. 260; *ActewAGL, Revised access arrangement information*, January 2016, p. 24.

445 Jemena, *Attachment 06-01 Rate of return and gamma [PUBLIC]*, January 2016, p. 13; AGN, *Attachment 10.26 Rate of Return [PUBLIC]*, January 2016, p. 2.

446 AusNet Transmission Group Pty Ltd, *Transmission Revenue Review 2017–2022 regulatory proposal*, 30 October 2015, p. 191; United Energy, *Revised Regulatory Proposal, 2016-20*, January 2016, p. 79.

447 APTNT, *Access Arrangement Revised Proposal Response to Draft Decision*, January 2016, p. 88.

448 Powerlink, *Queensland revenue proposal*, January 2016; TasNetworks, *Tasmanian distribution regulatory proposal: Regulatory control period 1 July 2017 to 30 June 2019*, 29 January 2016.

449 Houston Kemp, *Response to the draft decision on the return on debt allowance*, January 2015, p. 4; NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014, p. 10.

450 ActewAGL, *Revised regulatory proposal*, January 2015, pp. 431–432; Ausgrid, *Revised regulatory proposal and preliminary submission,* January 2015, pp. 70–71; AusNet Services, *Draft decisions NSW/ACT electricity distribution determination 2015–19*, February 2015, pp. 11–16; CitiPower/Powercor, *Submission in relation to the first round of regulatory determinations under the new rules*, February 2015;Endeavour Energy, *Revised regulatory proposal*, January 2015, pp. 104–105, Ergon Energy, *Appendix C: Rate of return, Regulatory proposal*, October

- Lally (commissioned by us) and the South Australian Centre for Economic Studies (SACES) recommended a credit rating for energy networks of BBB to BBB+.[451]

In contrast, consumer groups generally submitted the benchmark credit rating of BBB+ was too low. For instance:

- The Chamber of Commerce and Industry Queensland (CCIQ) and Energy Consumers Coalition of South Australia (ECCSA) submitted that credit ratings of BBB and BBB+ are too low.[452] ECCSA specifically noted this was the case given benchmark firms' gearing levels.[453]
- The Victorian Energy Consumer and User Alliance (VECUA) referred to an analysis by the Energy Users Rule Change Committee (EURCC) in 2011 to support their view that we should recognise or have regard to service providers' actual credit ratings.[454] VECUA submitted that we provide higher debt allowances than appropriate by basing these on credit ratings that are lower than service providers' actual credit ratings.[455] Further, VECUA also submitted that by using debt in a broad BBB band to estimate the allowed return on debt, the debt allowance we provide is predominantly based on more expensive debt ratings.[456] We note that several service providers disagreed with this submission.[457]
- The CCP submitted that we should account for the difference between service providers actual cost of debt and the BBB benchmark so the allowance better reflects service providers' actual debt costs.[458]

We are satisfied that a benchmark efficient entity would have a BBB+ credit rating. We formed this view, as well as our view on the benchmark term of issuance, from

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2014, p. 123;Essential Energy, *Revised regulatory proposal*, January 2015, p. 230; JGN, *Access arrangement: Response to the AER's draft decision and revised proposal, Appendix 7.10 — Return on debt response*, February 2015, pp. 6–10; SAPN, *Regulatory proposal 2015–20*, October 2014, p. 305; United Energy, *Submission in relation to the first round of regulatory determinations under the new rules*, February 2015. CEG, *WACC estimates*, May 2014, p. 64; CEG, *Memorandum: Factors relevant to estimating a trailing average cost of debt*, 24 May 2014, pp. 12–15.

451 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 28–3; SACES, *Independent estimates of the WACC for SAPN: Report commissioned by the SACOSS*, January 2015, pp. 13–14.

452 CCIQ, *Submission to the Australian Energy Regulator on Energex's regulatory proposal for the 2015-20 revenue determination*, January 2015; ECCSA, *AER review of SAPN application 2014: ECCSA response to AER's preliminary decision*, June 2015.

453 ECCSA, A response to the AER draft decision on AGN's AA2016 revenue reset, February 2016, p. 34.

454 ECCSA, *AER review of SAPN application 2014: ECCSA response to AER's preliminary decision*, June 2015.

455 VECUA, *Submission to the AER: Victorian Distribution Networks' 2016-20 revenue proposals*, January 2016.

456 Victorian Energy Consumer and User Alliance (VECUA), *Submission to the AER - AER Preliminary 2016-20 Revenue Determinations for the Victorian DNSPs*, January 2016, p. 18.

457 ActewAGL, AusNet Services and United Energy disagreed that our use of a broad BBB curve to estimate the return on debt was conservative in their favour. See ActewAGL Distribution, *Attachment 3: Response to submission made to the AER by the VECUA dated 6 January 2016*, p. 4; AusNet Services, *Response to submissions on the Victorian EDPR preliminary decision (2016–20)*, 4 February 2016, pp. 22–7; United Energy, *Submission to the AER's preliminary determination for United Energy (for 2016–20)*, 4 February 2016, pp. 4–9.

458 CCP, *Bruce Mountain: Comments on the AER's Preliminary Decision on the Weighted Average Cost of Capital (WACC) for Energex, Ergon and SA Power Networks*, July 2015, p. 8.

considering a set of firms that we consider com parable to a benchmark efficient entity.[459] We consider this is more consistent with incentive regulation than basing our allowance for individual service providers on their actual credit ratings or actual historical costs of debt.

In our preliminary decision, we had regard to the evidence and differing opinions put before us by different services providers, consultants and consumer groups. This included responding to the following issues raised by stakeholders:

- Whether the current industry median is BBB+ or BBB (raised by service providers).[460]
- The length of the period used to estimate the industry median (raised by service providers).[461]
- Whether we should exclude certain businesses from the comparator set used to estimate the industry median.[462]

Since we have not received further supporting information in the revised proposals or submissions, our view has not changed. We note in the revised proposals the businesses put forward the same substantive arguments for a lower credit rating as they submitted in their original proposals.[463] Our decision is to maintain a BBB+ benchmark credit rating. We have had regard to data over the short, medium and longer term with the majority of evidence supporting a benchmark credit rating of BBB+. We draw our comparator set for estimating the benchmark credit rating from Standard and Poor's industry report cards, with the exclusion of one business which is owned by an Australian state government.[464] We do not agree with the reasons put forward for excluding firms from the comparator set. Nevertheless, even if we applied all of the potential exclusion criteria, this would not support departing from a BBB+ benchmark credit rating.[465] For our supporting analysis, see our preliminary decision.[466]

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459 See, for example, AER, *Explanatory statement: Rate of return guideline*, December 2013, pp. 152–157; AER, *Explanatory statement: Rate of return guideline (appendixes)*, December 2013, pp. 126–130.

460 AER, *Preliminary decision Jemena distribution determination - Attachment 3 - Rate of return*, October 2015, p. 217.

461 AER, *Preliminary decision Jemena distribution determination - Attachment 3 - Rate of return*, October 2015, pp. 592–593.

462 These were put forward in CEG, *Attachment 7.01: WACC estimates, a report for the NSW DNSPs*, May 2014, p. 65; CEG, *Memorandum: Factors relevant to estimating a trailing average cost of debt*, 24 May 2014, pp. 14–15. For our response, see AER, *Draft decision: JGN access arrangement, Attachment 3*, November 2014, pp. 295–297.

463 AusNet Services, *Revised Proposal*, January 2016, pp. 7-33 to 7-35; CitiPower, *Revised proposal 2016-20*, January 2016, p. 344; Powercor, *Revised Regulatory Proposal*, 2016-2020, January 2016, p. 338; *ActewAGL, Revised access arrangement information*, January 2016, p. 24; Jemena, *Attachment 06-01 Rate of return and gamma [PUBLIC]*, January 2016, pp . 28–29; AGN, *Attachment 10.26 Rate of Return [PUBLIC]*, January 2016, p. 7; United Energy, *Revised Regulatory Proposal, 2016-20*, January 2016, p. 79; APTNT, *Access Arrangement Revised Proposal Response to Draft Decision*, January 2016, p. 88.

464 That is, Ergon Energy Corp Ltd.

465 AER, *Preliminary decision Jemena distribution determination - Attachment 3 - Rate of return*, October 2015, pp. 594-596.

Update of empirical evidence

Consistent with our estimate in the Guideline and preliminary decision, we have had regard to empirical evidence in applying a benchmark credit rating of BBB+.[467]

Table 3-12 sets out the median credit rating over historical periods of progressively longer length. While Table 3-12 shows some support for a credit rating of BBB, we consider it shows stronger support for a credit rating of BBB+.

We also note that this estimate entails taking the median from the yearly medians. We could also take the median of all credit rating observations over these time periods. This gives BBB+ for the five most recent periods, BBB/BBB+ for the period 2010–2015 and BBB for the longer averaging periods (2006–2015 to 2009–15). Both median of yearly medians and median of all observations show stronger support for a BBB+ benchmark credit rating. Similarly, having considered our presentation of this data in recent determinations, the Tribunal observed that the more recent years firmly point towards a BBB+ credit rating for the benchmark efficient entity.[468]

For further analysis regarding median credit ratings over historical periods, refer to our past decisions.[469]

Table 3-12 Median credit rating—Comparator set of firms

Time period	Median credit rating	Time period	Median credit rating
2015	BBB+	2010–2015	BBB/BBB+
2014–2015	BBB+	2009–2015	BBB
2013–2015	BBB+	2008–2015	BBB/BBB+
2012–2015	BBB/BBB+	2007–2015	BBB/BBB+
2011–2015	BBB/BBB+	2006–2015	BBB/BBB+

Source: Bloomberg (S&P), AER analysis.

In our preliminary decision, we also set out the comparator set we use to estimate the industry median.[470] Since that time, Powercor Australia LLC and the CitiPower Trust

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466 AER, *Preliminary decision Jemena distribution determination - Attachment 3 - Rate of return*, October 2015, pp. 214-218, 589–596.

467 AER, *Better regulation—Explanatory statement to the rate of return guideline*, December 2013, p.156; AER, *Preliminary decision Jemena distribution determination - Attachment 3 - Rate of return*, October 2015, p. 214.

468 Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, para 993.

469 AER, *Preliminary decision Jemena distribution determination - Attachment 3 - Rate of return*, October 2015, p. 217; AER, *Final decision Ausgrid distribution determination - Attachment 3 - Rate of return*, April 2015, p. 197.

470 AER, *Preliminary decision Jemena distribution determination - Attachment 3 - Rate of return*, October 2015, p. 590.

now raise debt under a common funding vehicle, Victoria Power Networks (Finance) Pty Ltd.[471] We have added this common funding vehicle to our comparator set.

The yearly median credit ratings across our updated comparator set since the 2006 calendar year end are shown in Table 3-13.

Table 3-13 Credit ratings of network service providers over time

Issuer	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
APT Pipelines Ltd	NR	NR	NR	BBB	BBB	BBB	BBB	BBB	BBB	BBB
ATCO Gas Australian LP	NR	NR	NR	NR	NR	BBB	BBB	A-	A-	A-
DBNGP Trust	BBB	BBB	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-
DUET Group	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	NR	NR	NR
ElectraNet Pty Ltd	BBB+	BBB+	BBB+	BBB	BBB	BBB	BBB	BBB	BBB+	BBB+
Energy Partnership (Gas) Pty Ltd	BBB	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-
Australian Gas Networks Ltd	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB	BBB+	BBB+
ETSA Utilities	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-
Powercor Australia LLC	A-	A-	A-	A-	A-	A-	A-	BBB+	BBB+	NR
AusNet Services	A	A	A-	A-	A-	A-	A-	A-	A-	A-
SGSP Australia Assets Pty Ltd	NR	NR	A-	A-	A-	A-	A-	BBB+	BBB+	BBB+
The CitiPower Trust	A-	A-	A-	A-	A-	A-	A-	BBB+	BBB+	NR
United Energy Distribution Pty Ltd	BBB	BBB	BBB	BBB	BBB	BBB	BBB	BBB	BBB	BBB
Victoria Power Networks Pty Ltd	NR	NR	NR	NR	NR	NR	NR	NR	NR	BBB+
Median (year)	BBB/ BBB+	BBB/ BBB+	BBB+	BBB	BBB	BBB	BBB	BBB/ BBB+	BBB+	BBB+

Source: Bloomberg, Standard and Poor's, AER analysis.

Use of independent third party data series

[471] Spark Infrastructure, *Victoria Power Networks announces new joint funding vehicle for CitiPower and Powerco*r, 2 November 2015, see http://www.asx.com.au/asxpdf/20151102/pdf/432p758z1zn56z.pdf.

Our decision is to estimate the return on debt by reference to an independent third party data series. Using third party data series is the same approach we proposed in the Guideline.[472]

Service providers with proposals currently before us all proposed using independent third party data series to estimate the return on debt, with the exception of United Energy. While United Energy stated its proposal is based only on independent third party data series, an examination of United Energy's proposed method reveals that this is not the case.[473]

We agree with the service providers that proposed to use independent third party data series to estimate the return on debt. We do not agree with United Energy's proposal which would require the AER to empirically derive its own yield curves, based on United Energy's proposed method of estimation, rather than using only yield curves sourced from independent third party providers.

The CCP and several other consumer groups raised our use of third party data service providers as an issue in several of the current or recent regulatory processes. For instance, the CCP recommended using service providers' actual borrowing costs as a reasonableness check and/or using an industry index based on actual borrowing costs.[474]

We are satisfied that using a third party data series (or multiple series), appropriately chosen, is commensurate with the efficient debt financing costs of a benchmark efficient entity. It is also consistent with the rule requirement that the change in revenue (resulting from the annual debt update) is effected through the automatic application of a formula that is specified in the determination. This is because:

- A third party data series can be practically applied in the annual debt update process—We discuss this point further below.
- A third party data series is independent information developed by finance experts with access to financial datasets—These experts develop this independently from the regulatory process and for the use of market practitioners.
- Using a third party data series also reduces the scope for debate on debt instrument selection and curve fitting—For instance, independent data service providers have already exercised their judgement on bond selection, curve fitting and adjusting yields. However, we still must exercise our regulatory judgement to assess which third party data series (or combination of series) is better suited for contributing to the achievement of the ARORO.
- There is no consensus among Australian regulators on the best method to estimate the return on debt—Some regulators use independent third party data series while

[472] AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 126–130.

[473] We explain this in the 'Response to key issues raised by stakeholders' section below.

[474] CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2014, pp. 4, 12.

others use their own data series (with or without it being cross checked against a third party data series).[475] The Tribunal has found both approaches reasonable.[476]

We explain our first reason listed above in more detail here. The rules require that if we apply annual updating (or any other approach that could result in a different return on debt each year), then the change in revenue must be effected through the automatic application of a formula that is specified in the determination. Even if this were not a rule requirement, we consider using a third party data series is likely to be the only practical option to update the return on debt annually. This position is supported by NERA (commissioned by TransGrid in a recent decision process), who advised that:

> …a third party data service provider is essential to allow the return on debt to be updated automatically'.[477]

Alternatives, such as calculating and implementing our own data series, would likely require us to apply a greater element of judgement and involve far greater complexity of calculations. For example, we may need to exercise judgement over whether we should exclude certain bonds as outliers. Consultation on these matters, and the complexity of calculations, would be impractical to achieve during the annual debt update process. The annual debt update we propose is set out below after the section on the averaging period. This process needs to occur relatively quickly and without consultation. Using a third party data series enables this. This is because we can consult on the choice of the data series and any implementation issues (for example, weighting of data series, extrapolation, or interpolation issues) when making the determination. We can then add a formula to the determination and apply it mechanistically during the annual debt update process.

Response to key issues raised by stakeholders

During the Guideline development process, we considered the use of a third party data series, in consultation with stakeholders.[478] Service providers tended to support using a

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475 IPART has switched from having its own approach to using an independent data service provider (the RBA). The ERA has developed its own bond yield approach and the QCA engaged PwC to develop its own econometrically derived approach (and combines this with using a third party data series as a cross check). The ESCV and ESCOSA have been using an independent data service provider (Bloomberg). See IPART, *New approach to estimating the costs of debt: use of the RBA's corporate credit spreads*, February 2014; QCA, *Final decision: Cost of debt estimation methodology*, August 2014, p. ii; ESC, *Price review 2013: Greater metropolitan water businesses - Final decision*, June 2013, p. 108; ESCOSA, *SA Water's water and sewerage revenues 2013/14-2015/16: Final determination statement of* reasons, May 2013, p. 140.

476 The Tribunal largely upheld the ERA's own bond-yield approach. See Australian Competition Tribunal, *Application by DBNGP (WA) Transmission Pty Ltd (No 3) [2012] ACompT 14*, 26 July 2012, Para 620. Similarly, the Tribunal has endorsed proposals to rely on an independent data service provider alone. See Australian Competition Tribunal, *Application by United Energy Distribution Pty Limited [2012] ACompT 1*, 6 January 2012, para 462.

477 NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014, p. 10.

478 See AER, *Explanatory statement to the rate of return guideline*, December 2014, pp. 126–130; AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2014, pp. 199–200.

third party data series.[479] While consumer representatives tended to consider we should develop our own data series.[480] We acknowledge these views. However, our decision is to use a third party data series, in the context of annual updating. This is for the reasons set out above.

As noted above, United Energy's proposed method does not use only third party data series. United Energy's proposal is for the AER to compare a range of data series each year against observed bond yields based on United Energy's particular method for choosing those bond yields. The data series that United Energy proposed be compared includes third party data series, but also includes two yield curves that the AER would be required to estimate itself each year. United Energy's proposed method for the AER to follow in this estimation involves bond selection criteria and the Nelson-Siegel curve fitting methodology for one curve, and a par yield curve fitting methodology for the second curve. These options were recommended by Esquant, who is a consultant commissioned by United Energy.[481]

United Energy's proposed method is contrary to several of the benefits of adopting an independent third party data series. The benefits are:

- An independent third party data series is already calculated by another party, and can be used directly by the AER (with the exception of adjustments concerning extrapolation, interpolation and/or annualisation). The use of third party data series is therefore a practical choice that facilitates the annual debt update process. In contrast, United Energy's proposed method involves complex empirical estimation processes that would need to be performed every year, for every service provider (if applied more broadly), and in very short timeframes. It is therefore not a practical choice where the return on debt is being updated each year.
- An independent third party data series is developed by experts who are independent of the regulatory process. In contrast, United Energy's proposed data series is not independent of the regulatory process. This position is supported by Lally, who stated:

> UED is clearly alive to the possibility that Esquant's work might not be viewed as that of an independent provider and states that this work "…should be regarded as an independent and credible data source..". However, in my view, an entity hired by a regulated business is not an independent provider and UED cannot turn black into white merely by saying that it should be regarded

[479] ENA supported using Bloomberg FVC and APA Group supported the continued reliance on Bloomberg. ENA, *Response to the draft guideline*, October 2013, p. 56; APA, *Submission to the draft guideline*, October 2013, p. 35.

[480] PIAC, *Submission to the draft guideline*, October 2013, pp. 45–46; MEU, *Comments on the draft guideline*, October 2013, pp. 29–33; EUAA, *Submission to the draft guideline*, October 2013, p. 6. COSBOA, *Comments–draft guideline*, October 2013, p. 4.

[481] United Energy, *Initial regulatory proposal—Attachment: Rate of return on debt*, April 2015, pp. 25–28; Esquant, *The development of yield curves, zero coupon yields, and par value yields for corporate bonds—A report prepared for United Energy and Multinet Gas in response to the AER's draft rate of return guideline*, 17 October 2013.

as white. Thus, Esquant's work is not that of an independent provider, and therefore fails a test that is imposed by UED.[482]

For these reasons, and the reasons set out in the next section, we therefore do not agree with United Energy's proposal which includes the use of non-third party independent data series. Importantly, we remain satisfied that our decision approach, relying on third party data series, will contribute to achievement of the ARORO.

Choice of third party data series (including adjustments)

In the previous section, we explained our decision is to use third party published data series to estimate the allowed return on debt, rather than deriving our own data series. In this section, we explain our choice of third party data series, including adjustments we have decided to make to those data series.

Our decision is to adopt a simple average of the debt data series published by the RBA and Bloomberg that match, as close as available, our benchmarks of a BBB+ credit rating and a 10 year debt term. Specifically, our decision is to adopt a simple average of:

- the 10 year estimate from the non-financial corporate BBB rated data series published by the RBA (the RBA curve),[483] and
- the 10 year yield estimate from the Australian corporate BBB rated Bloomberg Valuation Service (BVAL) data series published by Bloomberg (the BVAL curve).[484]

The RBA and BVAL curves are both 'broad BBB' rated data series in that they reflect bond pricing generally across the BBB+, BBB and BBB- rated spectrum of bonds.

Our decision is also to make certain adjustments to the RBA and BVAL curves so these rates are consistent with our 10 year benchmark debt term and also so they can be applied across the dates of a service provider's averaging periods. Those adjustments are:

For the RBA curve, to extrapolate the data series from a 'target' 10 year term to an 'effective' 10 year term using the method recommended by Dr Lally (the Lally method),[485] to interpolate the monthly data points to produce daily estimates, and to convert the estimates from a semi-annual to an effective annual rate.

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482 Lally, *Review of submissions on implementation issues for the cost of debt*, 18 October 2015, p. 23.

483 The RBA data series is available on the RBA's website in Statistical Table F3: http://www.rba.gov.au/statistics/tables/index.html#interest-rates

484 The BVAL data series is available through a licence service from Bloomberg under the code 'BVCSAB10 index'. As of 14 April 2015, Bloomberg had revised its methodology for the BVAL curve and had recommenced publishing a 10 year yield estimate.

485 While the RBA publishes an estimate for a 10 year 'target' term, the 'effective' term of the RBA's estimate is commonly less than 10 years, and so requires extrapolation to produce a 10 year term. This is because the RBA's method involves weighting bonds with less weight placed on bonds the further the term to maturity of the bond is from the 10 year target term. There are commonly more bonds with terms to maturity of less than 10 years than there are bonds with terms to maturity greater of than 10 years. As a result, the RBA's methodology places greater

- For the BVAL curve, to convert the estimates from a semi-annual to an effective annual rate.[486]
- The above positions are consistent with the approach we adopted in the first round of decisions since the publication of the Guideline, the most recent being our decisions released in November 2015.[487]

We are satisfied that a simple average of the two curves will result in a return on debt that contributes to the achievement of the ARORO. This is because:

- Based on analysis of the bond selection criteria (including approach for identifying outliers), we consider that both approaches employed by the RBA and Bloomberg have their unique strengths and weaknesses, but we are not satisfied that either is clearly superior.
- Based on analysis of the curve fitting (or averaging) methodologies, we consider that both approaches have their unique strengths and weaknesses, but we are not satisfied that either is clearly superior.
- Both curves require adjustments from their published form to make them fit-for-purpose, and we are not satisfied that either can be more simply or reliably adjusted to estimate the annual return on debt.[488]
- A simple average is consistent with expert advice from Dr Lally that we adopt a simple average of the BVAL curve and the RBA curve, subject to the necessary adjustments to each curve. [489] In particular, Lally concluded that based on analysis of the curves, it was reasonably likely that a simple average of the two curves would produce an estimator with a lower mean squared error (MSE) than using either curve in isolation. Lally also advised:

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weight on the collective pool of bonds with terms of less than 10 years, which results in the 'effective' (or average) term being less than the 10 year 'target' term of the RBA curve: see ACCC Regulatory Economic Unit, *Return on debt estimation: A review of the alternative third party data series*, August 2014, pages 34–40. The Lally method of extrapolation is set out in Lally, *Implementation issues for the cost of debt*, 20 November 2014, pp. 38–44.

486 As of 14 April 2015, Bloomberg revised its methodology for the BVAL curve and has recommenced publishing a 10 year yield estimate. In the current round of decisions, only Energex and Ergon Energy have averaging periods which commenced before 14 April 2015. Before 14 April 2015, the longest tenor estimate published by Bloomberg was either 5 or 7 years, depending on the dates, and therefore required extrapolation to produce a 10 year estimate. Accordingly, for Energex and Ergon Energy we have also applied an extrapolation adjustment to the Bloomberg data before 14 April 2015.

487 AER, *Final decision—JGN access arrangement 2015-20—Attachment 3—Rate of return*, June 2015, pp.3-201 to 3-216.

488 As of 14 April 2015, Bloomberg has revised its methodology for the BVAL curve (BVCSAB10). It has correspondingly recommenced publishing a 10 year yield estimate. Therefore, in applying this curve it only requires an adjustment to convert it into an effective annual rate, as set out in the formula for automatic application. However, the RBA curve requires several adjustments from its published form.

489 Lally, *Implementation issues for the cost of debt*, 20 November 2014, p.3; Lally, *Review of submissions on implementation issues for the cost of debt*, 18 October 2015, 5.

> …on the question of which index better reflects the cost of debt for the efficient benchmark entity, there is no clear winner.[490]

- The two curves have regularly produced materially different results at particular points in time. Both curves have their strengths and shortcomings, but it is not clear to us that one approach is clearly superior. Consequently, when the curves depart, we consider it is not easily discernible which curve produces estimates that better reflect the efficient financing costs of a benchmark efficient entity. We also note that the BVAL curve has produced estimates both higher than, lower than, and similar to, the RBA curve, depending on the particular point in time. So there is no clear indication that one curve produces systematically higher or lower estimates than the other.
- A simple average of two curves, in these circumstances, is consistent with the Tribunal's decision in the ActewAGL matter where the Tribunal concluded that:

> …if the AER cannot find a basis upon which to distinguish between the published curves, it is appropriate to average the yields provided by each curve, so long as the published curves are widely used and market respected.[491]

- A simple average of the two curves will reduce the likely price shock if either curve becomes unavailable or produces erroneous estimates during the period.

In our previous decisions, we have explained each of these reasons in more detail.[492] This analysis included the following evidence.

Dr Lally used the report of the Regulatory Economic Unit to identify 11 points of distinction between the RBA and BVAL curves. Lally analysed each of those differences and concluded:

> In summary, eleven points of distinction have been identified between the BVAL and RBA indexes. Point (11) is irrelevant in view of the AER not requiring historical data. In respect of points (3), (4), (6), (7) and (8), it is not possible to express a preference for one of the two indexes. The BVAL is favoured in respect of points (1) and (9), but the advantage in respect of point (9) is small. The RBA is favoured in respect of points (2), (5) and (10), but the advantage in respect of point (5) is small. The most that can be said here is that neither index is clearly superior to the other.[493]

Based on this analysis, Lally recommended using a simple average of the two curves. Lally advised:

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490 Lally, *Implementation issues for the cost of debt*, 20 November 2014, p. 5.

491 In this decision, the issue before the Tribunal was the choice between the Bloomberg fair value curve (BFVC) and the CBASpectrum curve, neither of which are currently published. See: *Application by ActewAGL Distribution [2010] ACompT4*, 17 September 2010, paragraph 78.

492 AER, *Draft decision—JGN access arrangement 2015-20—Attachment 3—Rate of return*, November 2014, pp. 3-134 to 3-158, 3-301 to 3-308.

493 Lally, *Implementation issues for the cost of debt*, 20 November 2014, p. 19.

> Firstly, on the question of which independent third-party data service provider should be used to estimate the cost of debt … I … recommend that a combined estimator be used. Since the standard deviations of these estimators are similar and it is not possible to quantify any biases in these two indexes, I recommend that the two indexes be equally weighted. This will lower the Mean Squared Error (MSE) of the estimator relative to using only one of the indexes, and significantly so if the correlation between the indexes is low.[494]

Those 11 points of distinction, and Lally's assessment of those differences between the RBA and BVAL curves, are summarised in the following table.

Table 3-14 Dr Lally's advice of the differences between the RBA and BVAL curves

No.	Points of distinction identified by REU[495]	Advice from Dr Lally[496]
1	The BVAL is available daily whilst the RBA is only available monthly.	BVAL favoured.
2	The BVAL is only available for terms up to seven years, and therefore would have to be extrapolated out to the desired ten years, whilst the RBA is at least notionally available for the desired ten year term.	RBA favoured. *Note: From April 2015, this point would have changed to "BVAL favoured" as Bloomberg commenced publication of a 10 year BVAL curve, which no longer requires any extrapolation adjustment.*
3	The BVAL sample of bonds is limited to those with a minimum pricing quality (liquidity measure), at least two months to maturity, and above retail size ($10m: see REU, 2014, page 20), whilst the RBA sample is limited to bond issues of at least $100mAUD and at least one year to maturity.	Not possible to express preference for one over the other.
4	The BVAL sample does not exclude financial corporations whilst the RBA's does.	Not possible to express preference for one over the other.
5	The BVAL sample is limited to unsecured bonds whilst the RBA's sample includes both secured and unsecured bonds.	RBA favoured, but advantage is small.
6	The BVAL sample is limited to bonds rated by either S&P or Moody's, whilst the RBA sample is limited to bonds rated by S&P or issued by a firm with an S&P rating.	Not possible to express preference for one over the other.
7	The BVAL sample is limited to AUD denominated bonds whilst the RBA sample also includes USD and Euro denominated bonds.	Not possible to express preference for one over the other.
8	The BVAL sample excludes bonds with call, put and	Not possible to express preference for one

494 Lally, *Implementation issues for the cost of debt*, 20 November 2014, p. 3.

495 Identified by REU, *Return on debt estimation: A review of the alternative third party data series: Report for the AER*, August 2014; and summarised by Lally, *Implementation issues with the cost of debt*, November 2014, pp. 7–8.

496 Set out by Lally, *Implementation issues with the cost of debt*, November 2014, pp. 8 to 19, and summarised on p. 19.

No.	Points of distinction identified by REU[495]	Advice from Dr Lally[496]
	conversion options, whilst the RBA sample does not exclude them.	over the other.
9	The BVAL methodology involves a par yield curve whilst the RBA's does not.	BVAL favoured, but advantage is small.
10	The BVAL methodology for curve fitting is (in large part) not disclosed whilst the RBA's methodology is disclosed.	RBA favoured.
11	The BVAL is only available back to February 2011 (continuously) whilst the RBA is available back to January 2005, and therefore there will be more problems obtaining a ten-year trailing average when using the BVAL.	Not relevant, as AER does not require historical data.

Source: Advice from Dr Lally.[497]

In our previous decisions, we explained each of these reasons in more detail.[498]

Recently, the Tribunal also upheld this approach, in relation to the NSW/ACT electricity distribution determinations and JGN gas access arrangement.

The Tribunal was satisfied that our approach of adopting a simple average of the information from both the RBA and Bloomberg data services in those reviews was legally open and appropriate, stating:[499]

> 983 … The AER had a choice to make as to what data services, or combination of data services, it should use. Its reasons for selecting the combination of data services are cogent, and reasonable. It is not shown to have misunderstood or overlooked material information. Although there are facts underlying the choice of the AER, the Tribunal is not persuaded of any particular material factual finding which is different from those made by the AER.

Similarly, in relation to the choice of a BBB+ credit rating, the Tribunal noted:[500]

> 993 The Tribunal is not satisfied that the AER's relevant Final Decisions on this topic disclose a ground of review. In the Final Decisions … is a table analysing the median credit ratings over time. The table itself is not apparently inaccurate. The more recent years point firmly towards a BBB+ credit rating for the BEE. The Tribunal does not consider that it was either factually wrong, or a wrong exercise of the discretion, to have regard to that material for the purpose of identifying the characteristics of the BEE.

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497 Lally, *Implementation issues for the cost of debt*, 20 November 2014.

498 AER, *Draft decision—JGN access arrangement 2015-20—Attachment 3—Rate of return*, November 2014, pp.3-134 to 3-158, 3-301 to 3-308.

499 [2016] ACompT 1 at 263

500 [2016] ACompT 1 at 265

Indeed, the Tribunal went further, noting that even if it was wrong in these findings, it would not be persuaded that it was materially preferable and in the long term interests of consumers to adopt a different approach to that adopted by the AER, noting:[501]

> 995 In any event, the Tribunal would not take the step of being satisfied, in either respect, that to vary or set aside the relevant Final Decision would, or would be likely to, result in a materially preferable NEO decision under s 71P(2a)(c).While some aspects of the Tribunal's decision have been challenged in the Full Federal Court, this aspect of the Tribunal's decision has not been challenged by any party.

We have assessed the new information received in current proposals from service providers who recommend that we depart from our previous position of adopting a simple average of the RBA and BVAL curves. That new information does not persuade us to depart from our position or reasons from recent decisions. We explain our reasons for this decision in the remainder of this section and in Appendix I.

We also requested Dr Lally review the recommendations from his previous report in light of the material submitted by service providers with current proposals. As part of that analysis, we requested Dr Lally review both the AER's approach and the various approaches proposed by service providers with current proposals against a set of criteria drawn from the requirements of the law and the rules, including the ARORO. After reviewing that material, Dr Lally concluded:

> …the AER’s proposed approach satisfies the criteria and these criteria are not satisfied by any other proposed approach.
>
> Finally, I have previously provided advice on these implementation issues to the AER and nothing in these submissions warrants any change in that advice.[502]

Response to key issues raised by stakeholders

Table 3-15 sets out the service providers' proposals.

Table 3-15 Choice of data series and adjustments: Summary of current service provider proposals

Service provider	Choice of data series	Extrapolation/interpolation adjustments
VIC electricity distribution revised proposals		
AusNet Services	Proposed simple average of RBA and Reuters curves. AusNet Services made two submissions after the window for	Proposed the Lally extrapolation method(s), consistent with our recent decisions.

[501] [2016] ACompT 1 at 265-6

[502] Lally, *Review of submissions on implementation issues for the cost of debt*, 18 October 2015, p. 5.

	submissions in which AusNet Services submitted the BVAL curve would not contribute to an estimate that achieved the ARORO.	
CitiPower and Powercor	Proposed weighted average of the RBA, BVAL and Reuters curves; with 50 per cent weight allocated to the RBA curve and 25 per cent allocated to each of the BVAL and Reuters curves.	Proposed adjustments to the RBA and BVAL curves consistent with our recent decisions.
Jemena Electricity Networks (JEN)	For the first averaging period, the data source or combination of data sources that best fits a representative sample of bond yields is used. For subsequent averaging periods, proposed a simple average of data points from all available third party data series using both Lally and SAPN extrapolation, unless there is a material (60 basis point) difference between the highest and lowest of the estimates. In which case a 'best fit' process is used to select between all available third party data series and extrapolation methods, or an average of all available third party data series and extrapolation methods. JEN proposed that all BBB rated third party data series with published yields of seven years or greater, and a simple average of all such data series, be tested.	See description in 'choice of data series' column. Selection is between the Lally and SAPN extrapolation methods. The SAPN extrapolation method extends the 7 year yield estimate using the slope of spreads to swap from all published term points (1,3,5 and 7 years) and the difference between the 10 and 7 year base rates.
United Energy	Proposed that a range of third party data series (with different extrapolation methods) and other information be tested each year against observed bond yields using United Energy's proposed 'best fit' approach. The data series that United Energy proposed be tested each year are the RBA data series, the Bloomberg BVAL or FVC data series, an empirically derived Nelson-Siegel yield curve estimated following United Energy's proposed method, an empirically derived par yield curve estimated following United Energy's proposed method, and any other sources of published yield information on A and BBB rated corporate bonds with yields of seven years and greater.	Proposed an annual 'best fit' test process to select between the Lally and SAPN methods.
Gas revised proposals		
ActewAGL	Proposed a 'best fit' process is used to select between all available third party data series and extrapolation methods, or an average of all available third party data series and extrapolation methods. ActewAGL proposed that all BBB rated third party data series with published	See description in 'choice of data series' column. Selection is between the Lally and SAPN extrapolation methods.

	yields of seven years or greater, and a simple average of all such data series, be tested. Note: In ActewAGL's initial proposal, it proposed that a 'best fit' process be used only when the highest and lowest of four data points (RBA curve with Lally extrapolation, RBA curve with SAPN extrapolation, BVAL curve with Lally extrapolation, and BVAL curve with SAPN extrapolation) is greater than 20 basis points. In its revised proposal, ActewAGL submitted that is maintains its initial proposal, but does not appear to refer to the 20 basis point threshold.[503]	
Australian Gas Networks (AGN)	Proposed an annual 'best fit' test process to choose between available third party data series and extrapolation methods.	Proposed an annual 'best fit' test to choose between the Lally and SAPN methods.
APTNT	Proposed sole reliance on RBA curve.	Proposed extrapolation (the Lally method) and interpolation methods for the RBA curve consistent with our recent decisions.

Source: Regulatory proposals.[504]

Having considered these proposals, our final decision is to maintain our approach as adopted in previous decisions and upheld by the Tribunal.[505] In summary, we consider we have had limited opportunity to undertake analysis of and consultation on the Reuters 10 year yield estimate due to it being raised late in the process (in the revised proposal) despite being available since May 2015. Further, we consider that adopting

503 While this was ActewAGL's revised proposal, it made a late submission on 12 May 2016 in which it updated its position to suggest that a simple average of the BVAL, RBA and Reuters curves would contribute to achievement of the ARORO. AGN, *Submission: Attachment 1: Implications of Tribunal decisions for ActewAGL Distribution*, May 2016, p. 7.

504 Victorian electricity revised proposals— AusNet Services, *Revised regulatory proposal*, January 2016, pp. 7-34–7-35; CitiPower, *Revised regulatory proposal*, January 2016, pp. 346–347; JEN, *Revised regulatory proposal: Attachment 6-1—Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 29–34; Powercor, *Revised regulatory proposal*, January 2016, pp. 340–341; United Energy, *Revised regulatory proposal: Attachment 8-2—Response to AER preliminary determination re: rate of return and gamma*, January 2016, pp. 20, 34–35. Gas revised access arrangement proposals— ActewAGL, *Revised access arrangement proposal: Appendix 5.01—Rate of return, gamma and inflation*, January 2016, pp. 36–40; AGN, *Revised access arrangement proposal: Attachment 10.26—Response to draft decision: Rate of return*, January 2016, pp. 37–38; APTNT (Amadeus gas pipeline), *Revised access arrangement proposal: Response to draft decision—Submission*, January 2016, pp. 83–88.

505 We recognise that this appeal considered our approach prior to Bloomberg publishing a 10 year BVAL estimate. However, we specified in our contingencies for the approach under appeal that we would adopt a 10 year estimate where Bloomberg resumed publication of it.

a changed proposal from service providers after, during or close to its averaging period would introduce upward bias into the regulatory decision making process.

Nonetheless, we have sought to evaluate all three curves to the fullest extent possible. For the reasons in this section and in Appendix I we remain satisfied that a simple average of the BVAL and RBA curves will contribute to an estimate that will achieve the ARORO. We have not yet formed a definitive view on the suitability of the Reuters curve, and are open to further consideration of this curve in the future.

- more specifically, we remain satisfied that the BVAL curve is fit-for-purpose, and combined with the RBA curve , are satisfied that it will contribute to an estimate which achieves the ARORO.
- in proposing their recommendations, neither the service providers nor CEG have addressed the impact of our conservative benchmark assumptions. Specifically:
    - in the Guideline, we adopted a 10 year benchmark term based on a weighted average term at issuance of 8.7 years observed amongst service providers.[506] Ordinarily, this will lead to an upward bias in our benchmark compared to the sector's costs of debt. Using the RBA curve since 2005, this difference leads to an average upward bias of approximately 14 basis points.[507]
    - we adopt a benchmark credit rating of BBB+ but estimate the return on debt using the 'broad-BBB' rated curves published by the RBA and Bloomberg. This means that these curves are estimated based on a bond sample that includes lower rated BBB and BBB– rated bonds. To the extent that the estimates produced by these curves reflect those lower rated bonds, this would similarly introduce an upward bias.

In Appendix I, we have set out more detailed analysis on our responses to issues raised by key stakeholders, including:

- the Reuters curve
- new criticisms of the BVAL curve
- other issues.

Annual testing for the choice of data series

Since our decision for JGN, we have set out our reasons for not adopting the annual testing approaches proposed by some service providers and recommended by CEG. In contrast, we are satisfied that a simple average of the BVAL and RBA curves extrapolated using the AER methodology will contribute to an estimate of the return on

506 AER, *Rate of return guideline—Explanatory statement*, December 2013, p. 141.

507 AER analysis, calculated using the RBA F3 data release—'aggregate measures of Australian corporate bond spreads and yields: non-financial corporate bonds'.

debt which achieves the ARORO. Amongst current proposals, ActewAGL,[508] AGN, JEN and United Energy proposed an annual process to test which of various curves, or averages of curves, 'best fit' a sample of bond yields during the particular service provider's averaging period in a particular year. These service providers propose to apply this annual testing methodology to select both the choice of data series and the extrapolation method.

We are not persuaded that either the service providers or CEG has identified material new reasons to justify adoption of an annual testing approach. In previous decisions, we have not adopted this annual testing approach for the following reasons:

- The premise of the 'best fit' method is that it assumes, by definition, that this test better reflects efficient financing costs than either the RBA or BVAL method, and we are not persuaded this is the case.
- Placing sole weight on the 'best fit' method ignores useful information that can be gathered from examining and analysing the underlying bond selection criteria and curve fitting methodologies of the RBA and BVAL methods.
- The particular 'best fit' methods that have been proposed to us by service providers are inconsistent with the rules requirement for a change in revenue from the annual debt update to be from an automatic application of a formula in the decision.[509]

We explain each of these reasons below.

Firstly, the following is a simplified explanation of the range of annual testing methods proposed by various service providers, which is helpful to illustrate our objection to its core premise:

- Assume there are three sets of bonds labelled Group A, Group B and Group C. The selection criteria for each group is different, but partially overlapping, meaning there is some commonality of the bonds in each group.
- Group A bonds are used to construct Curve A, Group B bonds are used to construct Curve B, and Group C bonds are used as a ‘test group’.
- The test is applied as follows—Curve A and Curve B are tested to assess which curve better fits the bonds in Group C, the test group.
- Assume Group A bonds and Curve A represent the BVAL methodology, Group B bonds and Curve B represent the RBA methodology, and Group C bonds represent the test group of bonds proposed by service providers (based on either the CEG or Esquant methodology).

[508] While this was ActewAGL's revised proposal, it made a late submission on 12 May 2016 in which it updated its position to suggest that a simple average of the BVAL, RBA and Reuters curves would contribute to achievement of the ARORO. AGN, *Submission: Attachment 1: Implications of Tribunal decisions for ActewAGL Distribution*, May 2016, p. 7.

[509] NER, cll. 6.5.2(l) and 6A.6.2(l), NGR, r. 87(12).

- The underlying premise of this test is that Group C bonds are a better reflection of the efficient financing costs of a benchmark efficient entity than Group A (BVAL) bonds or Group B (RBA) bonds. Unless this underlying premise is established then the fact that the Group C bonds might be a better fit to Curve A or Curve B in a particular year says nothing about which curve is a better reflection of the efficient financing costs of a benchmark efficient entity.

The service providers have not established that the test group of bonds they proposed (the 'Group C bonds' in the above illustration) are a better reflection of the efficient financing costs of the benchmark efficient entity than were the Group A bonds (based on Bloomberg's nominated selection criteria) or the Group B bonds (based on the RBA's nominated selection criteria). Rather, the proposals generally rely on an assumption that because the test group of bonds is large, it is therefore a good test group. Further, their proposed test group of bonds—which differed between the CEG and Esquant methodology—includes bonds that both the RBA and Bloomberg have excluded without explaining why both the RBA and Bloomberg were wrong to exclude these bonds.

Our adoption of a simple average of the RBA and BVAL curves was informed by the analysis from Lally, the REU and our own analysis. That analysis established that there were strengths and weaknesses with the RBA's and BVAL's bond selection criteria in relation to reflecting the efficient financing costs of a benchmark efficient entity, however, neither was clearly superior to the other.

The above simplified explanation is similar to the testing approach proposed by ActewAGL, AGN and JEN. United Energy proposed a similar though substantially more complex version of ActewAGL's, AGN's and JEN's approach. United Energy's approach is considerably more complex because, along with testing the available third party published data series, United Energy also proposed the AER empirically derive its own data series using two separate complex methodologies and add these into the mix of curves to be tested. However, despite this additional complexity, we are not satisfied United Energy's approach adds to the accuracy of this annual testing process, because of the reasons set out in this section that apply to any such annual testing approach.

Secondly, we consider it is appropriate to select a data series (or average of data series) 'up-front' in circumstances where there is detailed information available to us at the time of the decision about both the RBA curve and BVAL curve and that information did not disclose that one was superior to the other.

In contrast, the annual testing approach treats each curve as a 'black box', when they are not. We might adopt an approach like that if we were unable to analyse the underlying characteristics of the curves (that is, the bond selection criteria and curve fitting methodology). However, this is not the case. The RBA and BVAL have applied their expertise to assess debt market information. Each determined a distinct approach to synthesize the available corporate bond data into yield curves. We have a substantial amount of available information on the bond selection criteria of both curves. Further, we have a fair degree of available information on the curve fitting (or averaging) methodology used by the RBA, and some available information on

Bloomberg's curve fitting methodology. We have assessed that available information. Based on our assessment of the underlying characteristics of the RBA and BVAL curves we consider both curves have strengths, but neither curve is clearly superior to the other.

Some service providers have stated this reasoning is inconsistent with the principles articulated by the Tribunal in *Application by Jemena Gas Networks (NSW) Ltd (No 5) [2011] ACompT 10*, in which the Tribunal determined to use a particular curve over another on the basis that it provided a better fit to the available data.[510] We disagree. In the JGN matter, the Tribunal said:

> In ActewAGL averaging of rival fair value curves was undertaken because there was no clear basis to justify a preference for one curve over the other. Here, by way of contrast, Professor Handley was somewhat equivocal in his support for the CBA Spectrum curve; Dr Hird meticulously evaluated different groupings of bonds and made many adjustments to allow for non-standard bond features, and his tests clearly pointed to the superiority of the Bloomberg curve over many different iterations; and the publishers of the CBASpectrum curve have stopped producing it, citing lack of relevance to the market.[511]

The Tribunal was thus persuaded by expert evidence favouring one curve over another; which included the fact that one of the curves in contention had ceased to be produced. In contrast, both the RBA and BVAL curves continue to be produced and there is expert support for each data source. We consider our proposed approach to averaging the BVAL and RBA curves is thus entirely consistent with the Tribunal's decision in Application by Jemena Gas Networks (NSW) Ltd (No 5), and also with the endorsement given by the Tribunal to curve averaging in *Application by ActewAGL Distribution [2010] ACompT 4*.[512]

We further note that both the ActewAGL and JGN matters appeared before the Tribunal before the change to the rules that permits annual updating of the allowed return on debt. In the ActewAGL matter, the Tribunal cautioned against any sort of 'best fit' testing that did not use judgement and a qualitative approach to check for outliers in the sample of bonds used as the test group.[513] However, the new rules that permit annual updating also require for a change in revenue from the annual debt update to be from an automatic application of a formula in the decision.[514] Accordingly, the rules no not permit the sort of qualitative approach to checking for outliers that the Tribunal considers important if an annual testing approach was adopted.

Thirdly, and most significantly, following on from the last point, we consider the annual 'best fit' test to curve and extrapolation method selection is inconsistent with the rules. The rules provides that if the return on debt is to be estimated using a methodology

510 *Application by Jemena Gas Networks (NSW) Ltd (No 5) [2011] ACompT 10.*

511 *Application by Jemena Gas Networks (NSW) Ltd (No 5) [2011] ACompT 10* at [83].

512 Application by ActewAGL Distribution [2010] ACompT 4 at [78].

513 Application by ActewAGL Distribution [2010] ACompT 4 at [67–68].

514 NER, cll. 6.5.2(l) and 6A.6.2(l), NGR, r. 87(12).

which results in (potentially) different returns for different regulatory years, then "a resulting change to the service provider's total revenue must be effected through the automatic application of a formula that is specified in the determination".[515] In the 2012 rule determination, the AEMC said in relation to this rule that "the formula for calculating the updated return on debt must be specified in the regulatory determination or access arrangement and must be capable of applying automatically".[516] We are not satisfied that proposed approaches to estimating return on debt by reason to a 'best fit' data source could be formulaically applied as required by this rule.

The annual 'best fit' test that was initially proposed by JGN forms the basis for the annual 'best fit' test proposed by a number of service providers with current proposals. This process entails the use from year to year not only of the RBA curve and/or the BVAL curve, but "any other sources of published yield information for corporate bonds which are well recognised and used by market practitioners". Further, for the purpose of ascertaining yields from the observed foreign currency bond data, this approach includes a conversion to Australian dollar equivalents by use of swaps "in a methodology that is well accepted in the finance industry".

However, the rules do not permit the calculation of return on debt from year to year by reference to qualitative assessments of whether a particular data source is "well-accepted". In this regard, rule 87 of the NGR formerly provided that in determining a rate of return on capital, a "well accepted approach that incorporates the cost of equity and debt, such as the Weighted Average Cost of Capital" and a "well accepted financial model, such as the Capital Asset Pricing Model", are to be used. However, this criterion was deleted following the 2012 rule change The NER and NGR now specifically require debt allowances to be updated "through the automatic application of a formula that is specified" in the final decision, and have eliminated the difficulties involved in subjective determinations of what "well accepted" means.

We consider both of these steps (i.e. determination of a well-accepted or well-recognised methodology) requires extensive use of judgement, as there is no objective standard for wide use, recognition or acceptance of a method within the finance industry. For example, in relation to:

- The identification of relevant yield curves—How would the AER determine if a yield curve was 'well recognised' and 'used' by market practitioners? Would the AER be required to conduct a survey of market practitioners each year to determine which yield curves were 'well recognised' and 'used' by market practitioners in that particular year? Which market practitioners would the AER need to survey to construct a representative sample? What proportion of that sample would need to use the yield curve for it to be considered 'well recognised'? And 'used' for what purpose or purposes by market practitioners?

515 NER, cll. 6.5.2(l) and 6A.6.2(l), NGR, r. 87(12).

516 AEMC, *Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services, Final Position Paper*, 29 November 2012, p 91.

- The selection of the cross-currency conversion methodology—How would the AER determine if a cross currency conversion formula was 'well accepted' within the finance industry? Would the AER be required to conduct a survey of the finance industry each year to determine which conversion methodologies were 'well accepted' that year? Who in the finance industry would the AER need to approach? What proportion of that sample would need to use the cross-currency conversion methodology for it to be considered 'well accepted'? What if no particular methodology had wide acceptance? What if multiple methodologies had wide acceptance?

Accordingly, the JGN method, which has been adopted by a number of service providers leaves many questions unanswered. Answering these questions would involve, each year, considerable amounts of analysis, judgement and possibly consultation. We are not satisfied this proposed formula can be 'automatically applied', as required by the rules.

We are also not satisfied that United Energy's proposed method meets the rules requirement for automatic application. This is because, on the one hand, United Energy proposed an annual 'best fit' method, based on a report from Esquant. However, among the data series to be tested, United Energy proposed the AER should empirically derive its own yield curves based on the Nelson-Siegel and pay yield curve fitting methodologies. In addition to the practical difficulties involved with using non-third party data series, as explained in the previous section, there is a further problem with United Energy's approach which means it cannot be automatically applied. This further problem is explained by Lally, who stated:

> UED (2015, pp. 24-30) favours a similar process to that of JEN, in choosing between independent providers of DRP curves according to their goodness-of-fit to data collected in accordance with particular criteria, but subject to dispensing with the preliminary test of materiality in differences and also augmenting the set of independent providers by the results from Nelson-Siegel and par yield curves (applied to bond yields on bonds selected in accordance with criteria determined by Esquant (2013)). In addition, UED (2015, page 29) also states that, "notwithstanding the goodness-of-fit tests…precedence will be given to the results from the Nelson-Siegel yield curves and from par yield curves…".
>
> This approach has the following drawbacks. Firstly, the requirement to annually determine the set of independent data providers violates the requirement in Rule 6.5.2 (1) of the NER and Rule 87 (12) of the NGR for the annual updating of the cost of debt to be formulaic. Secondly, the process involved in testing for goodness of fit also violates the formulaic requirement in the NER and NGR. Thirdly, the requirement to give precedence to the results from the Nelson-Siegel yield curves and from par yield curves requires

judgement over when these results would supplant all others, and therefore also violates the formulaic requirement of the NER and NGR.[517]

We maintain these reasons as set out in previous decisions,[518] and are satisfied that they remain relevant. Our detailed explanation of these reasons is set out in previous decisions. In addition, we note that our decision on the JGN approach was upheld by the Tribunal.[519]

Extrapolation and interpolation

Our decision on extrapolation and interpolation issues is to maintain the approach set out in our recent decisions. This refers to:

- Extrapolation—where we need to extend a curve beyond its observed or published range. For example, before April 2015, Bloomberg publishes its BVAL curve to a maximum term of 7 years, whereas we require an estimate for a 10 year term.
- Interpolation—where we need a value for which there is no published estimate but it lies between two published estimates. For example, the RBA only publishes its curve estimates for one day each month, but we require estimates for each business day.

Specifically, we will make the following adjustments as set out in Table 3-16 and Table 3-17.

Table 3-16 Adjustments to the RBA curve

Adjustment Type	Amendment made?	Comments
Interpolation to construct daily estimates.	Yes	The RBA curve only provides an estimate for one business day at the end of each month. In our experience, averaging periods commonly start and/or end on dates during the month. We will address this issue by linearly interpolating between month end values where possible. While we are satisfied that interpolation over business days is also reasonable, we will interpolate over all days because: • this is consistent with our widely accepted approach to interpolate estimates of the risk free rate using CGS • interpolating over all days is simpler to implement • it is impractical to interpolate over business days for estimating the risk free rate, as this would require calculations relative to specific trading

517 Lally, *Review of submissions on implementation issues for the cost of debt*, 18 October 2015, p. 23.

518 For example: AER, *Preliminary determination: Citipower—Attachment 3: Rate of return*, October 2015, pp. 230–236. These reasons are common across all October/November 2015 determinations.

519 Australian Competition Tribunal, *Application by Jemena Gas Networks (NSW) Ltd [2016] ACompT 5*, March 2016, para 47.

Adjustment Type	Amendment made?	Comments
		days 10 years in advance • the difference to the estimates between interpolating over business days or interpolating over all days is immaterial.[520] Where this is not practical due to timing, we will hold the last available RBA monthly estimate constant until the end of the averaging period. It would not be practical to linearly interpolate between two RBA monthly estimates where the allowed return on debt must be estimated and incorporated into the annual debt update process before the publication of the next RBA monthly estimate after the end of the averaging period. Our draft decision on the annual debt update process is set out in the annual debt update process later in this attachment.
Extrapolation to target term.	Yes	The 'effective term' of the RBA bond sample is commonly less than 10 years. For this reason, Lally recommended that the spread component of the yield should be extrapolated from its effective term at publication to the benchmark term (10 years).[521] We agree with Lally's recommendation to extrapolate the spread component of the RBA's published yield in order to match it with the benchmark term of debt. Further, while the benchmark term of debt is 10 years, this benchmark was based on analysis of debt issuance that indicated a weighted average of 8.7 years amongst the benchmark sample.[522] Our benchmark sample consisted of service providers that were comparable to our definition of the benchmark efficient entity. We were therefore satisfied the average term at issuance for this sample was reflective of efficient financing costs. Similarly, from its earliest available publication to February 2015, the average effective term of the RBA's bond sample for its 10 year estimate is also 8.9 years.[523] We recognise that the effective term of the RBA's sample may change each month. In some months, the effective term may be above or below its long term average. However, the long term average effective term to maturity is similar to the average term at issuance of our underlying benchmark sample. Therefore, while this average effective term is less than our stated benchmark term, it is consistent with the evidence of efficient financing practices that the benchmark term was based on. As such, extrapolation to match the benchmark term may result in overcompensation on average compared to the efficient financing costs of the benchmark efficient entity. In this decision, we have maintained our position from recent decisions to extrapolate the RBA curve. However, we may revisit this in in future decisions or the next Guideline review.
Conversion to effective annual rate	Yes	The RBA's published methodology does not explicitly specify whether the published yields should be interpreted as effective annual rates. Effective annual rates are a consistent basis on which to compare bond rates and imply that the coupon payments compound during the year. We therefore consulted the RBA, who informed us that 'the spreads and yields in F3 can be best thought of as annual rates with semi-annual compounding'.[524]

520 For example, the difference between approaches over 2 June 2014 to 30 June 2014 was 0.22 basis points, or 0.0022 per cent.

521 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38–44.

522 AER, *Rate of return guideline—Explanatory statement*, December 2013, p. 136.

523 RBA, *Aggregate measures of Australia corporate bond spreads and yields*, available at: http://www.rba.gov.au/statistics/tables/xls/f03hist.xls.

524 RBA, *Email in response to: AER follow up question on the basis of YTM quotations in RBA statistical table F3*, 16 October 2014.

Adjustment Type	Amendment made?	Comments
		Therefore, this would require conversion into an effective annual rate, using the same approach as is applied to the BVAL yield estimate. However, we understand that the bonds in the RBA's sample are a mix of bonds with annual, semi-annual, and quarterly coupon frequencies. At this stage, there remains some uncertainty whether in all cases the bond yields and credit spreads are converted into comparable terms (i.e., annual rates with semi-annual compounding) prior to combining them into the published credit spread estimates for the target tenors (such as 7 and 10 year estimates in table F3). We may further investigate this issue in the future. The materiality of this issue is also currently unclear.

Source: AER analysis

Table 3-17 Adjustments to the BVAL curve

Adjustment Type	Amendment made?	Comments
Interpolation to construct daily estimates	No	Bloomberg publishes daily estimates.
Extrapolation to target term	Depends on maximum term published by Bloomberg	For most of the time that the BVAL curve has been published, it has had a maximum term of 7 years. However, between September 2014 and November 2014, it was published to a maximum 5 year term.[525] In April 2015, Bloomberg revised its methodology for the BVAL curve (BVCSAB10) and it now publishes a 10 year estimate.[526] For the periods where 7 years is the maximum term, we extrapolate the spread component of the 7 year yield estimate to the 10 year target term. We have done so using the margin between the spread components of the extrapolated RBA 7 and 10 year yield estimates, converted to effective annual rates. We add to this extrapolation the difference between the base CGS estimates from 7 to 10 years. That is: BVAL yield 10 years = BVAL yield 7 years + difference in CGS from 7 to 10 years + difference in RBA extrapolated spread to CGS from 7 to 10 years As recommended by Lally,[527] we are satisfied this approach is comparably reliable to the more complex approaches submitted by other stakeholders,528 but is simpler to implement and based on publicly available data. For a period of time in 2014, the maximum published BVAL term was 5 years. Accordingly, we extrapolate the spread component of the 5 year yield estimate to the 10 year target term using an analogous methodology to that used to extrapolate from 7 to 10 years.

525 Specifically, from 15 September 2014 to 3 November 2014.

526 Specifically, 14 April 2015.

527 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38–44.

528 Incenta, *Methodology for extrapolating the debt risk premium*, June 2014, pp. 2–3.

Adjustment Type	Amendment made?	Comments
		Additionally, as of 14 April 2015, Bloomberg has revised its methodology for the BVAL curve (BVCSAB10). It has correspondingly recommenced publishing a 10 year yield estimate. Data from 14 April 2015 onwards, therefore does not require any extrapolation adjustment.
Conversion to effective annual rate	Yes	Bloomberg publishes its yield as annual rates with semi-annual compounding. This needs to be converted into an effective annual rate.

Response to key issues raised by stakeholders

Some service providers proposed an annual testing approach to choose between the Lally and SAPN extrapolation methods. We have not adopted an annual testing approach for the reasons set out above. CitiPower and Powercor initially proposed an annual testing approach, but in their revised proposals adopted adjustments to the RBA and BVAL curves consistent with our recent decisions.[529]

AusNet Services initially proposed that if one method was adopted, it should be the SAPN method.[530] However, in its revised proposal it adopted extrapolation method(s) consistent with our recent decisions.[531]

Dr Lally examined the initial proposal from AusNet Services and advised:

> Ausnet (2015, pp. 343-344) favours the SAPN extrapolation methodology in general on the basis of CEG's (2015a, sections 5.2-5.4) analysis of data in January 2015. However, as discussed in section 2.1, CEG's analysis conflates the merits of curve fitting/extrapolation methods with the merits of competing criteria for selecting bonds, and its conclusions (even if valid for the period examined) should not be extrapolated to other periods because the period examined is too short.[532]

We agree with Dr Lally's assessment. In relation to the SAPN extrapolation method, we are not satisfied that there is a compelling conceptual or practical basis to assume that yield curves should conform to a straight line along their entire length. While the impact of the SAPN extrapolation methodology only affects the curve from 7 to 10 years, its slope implicitly assumes a straight line path through all prior term points. In contrast, our approach relies only on the shape of the yield curve from 7 to 10 years as published by the RBA. We are satisfied that this is likely to be informative about the appropriate shape for the yield curve from 7 to 10 years. Further, we note that the 7 year RBA yield exceeded the 10 year RBA yield over the past year. CEG has

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529 CitiPower, *Revised regulatory proposal*, January 2016, p. 341; Powercor, *Revised regulatory proposal*, January 2016, p. 340; CitiPower, *Regulatory proposal*, April 2015, pp.234–235; Powercor, *Regulatory proposal*, April 2015, pp.242–243.

530 AusNet Services, *Regulatory proposal,* April 2015, pp.343–345.

531 AusNet Services, *Revised regulatory proposal*, January 2016, pp. 7-35.

532 Lally, *Review of submissions on implementation issues for the cost of debt*, 18 October 2015, p.21.

previously criticised the Bloomberg curve on the basis that it exhibited an inverted spread-to-swap curve and that this appears to be 'inconsistent with finance theory'.[533] However:

- we are not satisfied that an inverted yield curve, or an inverted segment of a yield curve appears to be inconsistent with any of the key finance theories to describe the shape of the yield curve.[534] In contrast, these theories provide direct explanations for why an inverted yield curve might occur.
- CEG's preferred RBA curve, on which it proposes whole reliance unless we adopt annual testing, has also recently and previously exhibited a negative slope from the 7 to 10 year yield and spread-to-swap estimates. This can be observed in Figure 3-23, and in Appendix I.
- Over 2016, application of the SAPN method introduces a 'kink' into the yield curve which CEG has not justified or reconciled with finance theory.

In addition, some service providers have previously expressed a preference to independently extrapolate the BVAL curve from 7 to 10 years, rather than adopting the published BVAL 10 year estimate.[535] This was based on advice from CEG. We approached Bloomberg to check CEG's understanding of the BVAL methodology. Bloomberg confirmed that CEG has not correctly understood its methodology. Dr Lally also examined CEG's report and found further errors in CEG's analysis.[536] Dr Lally's report also sets out Bloomberg's response to us, which we provided to Dr Lally to assist his analysis. Further, Dr Lally has examined the new 10 year estimate and concluded it is fit for the AER's purposes.

For these reasons, we remain satisfied that the method of extrapolation recommended by Dr Lally will contribute to achievement of the ARORO. Specifically, where there is a 10 year BVAL estimate we will use that estimate, but where that estimate is unavailable we will use the longest published BVAL estimate extrapolated to 10 years using the corresponding margin in the RBA estimate.

Choice of data series—Contingencies

Our decision is to largely maintain the set of contingencies as set out in our recent decisions. The two minor adjustments are clarifications to the contingency event labelled 'a different third party commences publication of a 10 year yield estimate'. These are:

533 Specifically, CEG concluded that the Bloomberg curve ' would give rise to estimates that are inconsistent with standard predictions of finance theory in that it would impose a downward sloping term structure for credit spreads (and inconsistent with a clear upward slope where there is available data);'

534 Being pure expectations theory, market segmentation theory or preferred habitat theory.

535 See SA Power Networks, *Revised regulatory proposal*, June 2015, pp.389–391.

536 Lally, *Review of submissions on implementation issues for the cost of debt*, 18 October 2015, pp.13–15.

- The change of approach previously referred to data providers not evaluated and included in our draft decision. We have updated this to reflect the final decision stage.
- We have clarified the event type to refer to circumstances where either a new third party commences publishing a 10 year curve, or occasions we are first made aware of a third party that already publishes a 10 year yield estimate. This change is only a clarification and does not change our interpretation of the event.

We have made our decision based on the information and third party data that is currently available.[537] Nonetheless, in our experience it is common that the availability of third party data changes. Our decision is to annually update the trailing average portfolio return on debt. Under the rules, the change in revenue resulting from the annual update must occur by automatic application of a formula that is specified in the decision.[538] This means our decision on how to apply these third party data sources must be fully specified upfront in the determination or access arrangement, and must be capable of application over the regulatory control or access arrangement period without the use of subsequent judgement or discretion. For this reason, we have set out a series of contingencies in Table 3-18, below. These describe how we propose to estimate the annual return on debt in the event of revisions in the RBA's or Bloomberg's methodologies or other changes to data availability.

Table 3-18 Contingency approaches to choice of data series

Event	Changes to approach
Either the RBA or Bloomberg ceases publication of Australian yield curves that reflect a broad BBB rating.	We will estimate the annual return on debt using the remaining curve.
A different third party commences publication of a 10 year yield estimate (or we are made aware of a different third party publishing a 10 year yield estimate)[539].	We will not apply estimates from a third party data provider that we have not evaluated and included in our final decision approach. We will consider any new data sources in future determinations.
Either Bloomberg or RBA substitutes its current methodology for a revised or updated methodology.	We will adopt the revised or updated methodology. Then, at the next regulatory determination, we will review this updated methodology. As noted above, we would also review any new data sources. However, if Bloomberg or the RBA backcasts or replaces data using a revised or updated methodology we will not use the backcasted data to re-estimate our estimates of the prevailing return on debt for previous years. This would be impractical and would create regulatory uncertainty over whether the allowed return on debt would at some point in the future be re-opened. Instead, we will

537 As of 14 April 2015, Bloomberg has revised its methodology for the BVAL curve (BVCSAB10). It has correspondingly recommenced publishing a 10 year yield estimate.

538 NER, cl. 6.5.2(l) and cl. 6A.6.2(l), NGR, r. 87(12).

539 Or we determine it is open to us to use the Reuters curve, following a proper assessment and period of consultation on this information.

Event	Changes to approach
	continue to use the Bloomberg or RBA data that we downloaded at the time of estimating the prevailing return on debt for that point in time.[540]
Bloomberg reduces the maximum published BVAL term from 10 years	If Bloomberg still publishes the BVAL curve to 5 or more years, we will extrapolate the BVAL curve from the longest published term using the 5 to 10 year yield margin from the RBA curve. If Bloomberg no longer publishes the BVAL curve to 5 years, we will rely entirely on the RBA curve.
The RBA ceases publication of a 10 year yield estimate.	If the RBA ceases publication of a 10 year yield estimate, we will extrapolate the RBA estimate to 10 years using: • if available, the margin between spreads in the Bloomberg curve,[541] from the RBA's longest published target term to 10 years • otherwise, the actual CGS margin from the RBA's longest published estimate to 10 years, plus the average DRP spread for the same term margin over the last month prior to the end of its publication.
The RBA commences publication of daily estimates.	We will cease interpolating the RBA monthly yields. Instead, we will estimate both the RBA yield and the RBA year extrapolation margin (used with the BVAL curve) using these daily estimates.
Either Bloomberg or the RBA publishes a BBB+ or utilities specific yield curve.	We will adopt the BBB+ or utilities curve in place of the provider's existing curve, on the basis that it is a closer fit to our benchmark efficient entity.

Source: AER analysis

In general, we have decided on these contingencies based on a series of guiding principles. These are that the contingency must:

- Be practically implementable—the rules require the automatic application of a formula to update the trailing average portfolio return on debt. As a result, we will be unable to analyse changes to the approaches or new approaches during the regulatory control or access arrangement period. Therefore, it is important that any contingency be practical and easily implementable.

540 For example, for the current decisions we downloaded the RBA monthly data observation for August 2015 shortly after it was published (in September), and incorporated this data point into our prevailing return on debt estimates. After the RBA published its monthly observation for September (in October), we downloaded this data point too. This final data point is only relevant for estimation of AusNet's placeholder averaging period. In doing so, we noticed that it appears the RBA has revised its methodology (though does not appear to have explained this change), and has backcast its monthly observations for the entire data series which starts in January 2005. However, we have not incorporated this backcasted RBA data into our return on debt estimates. Instead, we have continued to use the data we downloaded at the time of estimation. We note that if we had incorporated the backdated RBA data this would have decreased the allowed return on debt for the Queensland, SA and Victorian electricity distributors by between approximately 1–2 basis points. Accordingly, in this instance, our approach of not using the backdated data is in this group of service providers' interests. Our approach will be symmetrical and consistent over time, so we will not use backcast data that results from a change in the RBA or Bloomberg's methodology regardless of whether it is in or against the interests of particular groups of service providers or particular groups of consumers.

541 Specifically, the spread to CGS.

- Use the curve in a form as close as possible to its published form—for example, in April 2015 Bloomberg commenced publication of a 10 year BVAL curve. Accordingly, for averaging periods where the 10 year estimate is available, we will adopt this estimate rather than the 7 year BVAL curve extrapolated with RBA data.
- Where necessary, rely on the independent expert judgement of the RBA and Bloomberg—In particular, where the RBA or Bloomberg makes changes to its methodology, we would prefer to evaluate these changes before concluding we are satisfied the curve still meets the criteria set out in the Guideline.[542] However, this is not possible during the regulatory control or access arrangement period. In these circumstances, we therefore are faced with the two alternatives of ceasing to rely on the updated curve, or temporarily relying on the updated curve on the basis that we have assessed the data provider as credible. As we are satisfied that both the RBA and Bloomberg are credible and independent, but not that either curve is clearly superior, we consider it is preferable that we adopt the updated curve to limit stakeholders' exposure to the distinct characteristics of a single curve. This is consistent with our position of placing weight on both curves to minimise the mean squared error.

Response to key issues raised by stakeholders

CitiPower and Powercor proposed to make some adjustments to these contingencies. In particular, they proposed to:

- include the Reuters curve throughout the contingencies table
- remove the contingency relating to the BBB+ or utilities specific curve.

Our final decision is to maintain the contingencies as set out in previous decisions. For the reasons set out in this section, we have not adopted use of the Reuters curve for this final decision. We may revisit the use of this curve in future where there is scope for detailed analysis and consultation on the curve. However, we are currently not satisfied that use of the Reuters curve will promote achievement of the ARORO. We therefore do not agree that it should be included within the scope of our contingencies.

We also maintain our decision to adopt the BBB+ or utilities specific curve where either the RBA or Bloomberg commences publication of such a curve. In the rate of return guideline and in subsequent decisions, we have defined the benchmark entity as 'Similarly, for the reasons set out in this section, we have adopted a BBB+ benchmark credit rating.

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542 AER, *Explanatory statement–Rate of return guideline*, December 2013, pp. 23–24.

New issue premium

We accept JEN's revised proposal to not include an explicit allowance for the new issue premium. However, we do not agree with its commentary that excluding a new issue premium makes its proposed return on debt 'highly conservative'.[543]

We continue to be satisfied our current approach, without providing an uplift for a new issue premium,[544] contributes to the achievement of the ARORO. In particular, we are satisfied it is commensurate with the efficient financing costs of a benchmark efficient entity.[545] Our main reasons for our position are:

- Conceptually, we consider that a benchmark efficient entity would not face a new issue premium as part of its efficient financing costs.
- The evidence before us indicates that our return on debt allowance already appropriately compensates a benchmark efficient entity overall for its efficient financing costs.
- We consider that the empirical evidence on the new issue premium is inconclusive in general and that there is little consensus among experts on how to measure potential new issue premia.
- We are unaware of any academic literature on the new issue premium in the Australian market. On behalf of several service providers, CEG conducted an empirical analysis on the Australian market.[546] However, we have concerns with CEG's methodology, which we do not consider CEG has satisfactorily addressed.[547]

For a more detailed explanation of our reasons, see Appendix I of our final decision for United Energy.[548]

Averaging periods

Our final decision is to:

- accept JEN's proposed debt averaging period for the 2016 regulatory year
- not accept JEN's proposed process to nominate averaging periods for 2017, 2018, 2019 and 2020 throughout the regulatory control period.[549]

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[543] JEN, *2016-20 Electricity Distribution Price Review Regulatory Proposal - Attachment 6.1*, January 2016, p. 41.

[544] The service providers' submissions on this topic submit that a new issue premium is a systematic difference between yields at which firms issue bonds on the primary market (which would determine their effective cost of debt) and third party benchmark yield curves (which we use to estimate the debt allowance).

[545] NER, rules 6.5.2(c) and 6.5.2(h); NGR, rules 87(3) and 87(10).

[546] CEG, *The New Issue Premium*, October 2014.

[547] We raised some concerns in AER, *SA Power Networks Preliminary Decision - Attachment 3: Rate of Return*, April 2015, pp. 478-481. CEG responded to these concerns in CEG, *Critique of AER Analysis of New Issue Premium*, December 2015.

[548] AER, *Final decision: United Energy distribution determination - Attachment 3: Rate of return*, May 2016.

In its revised proposal, JEN also submitted a set of alternative averaging periods for 2017 to 2020, which it submitted in the event that we did not accept its proposed process for nominating averaging periods during the regulatory control period.[550] We agree with these alternative averaging periods.

We specify JEN's proposed averaging periods for the 2017 to 2020 regulatory years in confidential Appendix L. This is because our practice is to keep the dates of averaging periods confidential until they have expired.

In the preliminary decision for JEN, we used a placeholder averaging period of 19 consecutive business days commencing 4 August 2015 to estimate the allowed return on debt for the 2016 regulatory year. At that time, we also stated we would update this averaging period for the final decision and stated, in a confidential appendix, the dates we would use for this updating. In this final decision, we have updated JEN's allowed return on debt based on this averaging period, which was 15 business days from 16 November 2015 to 4 December 2015. We can specify this averaging period now because it has expired. We have used this averaging period to true up the preliminary estimate of allowed revenue for regulatory year 2016 that we determined in the preliminary decision.

In the Guideline, we proposed that service providers could nominate averaging periods of 10 or more consecutive business days up to a maximum of 12 months.[551] We also proposed that an averaging period should satisfy certain conditions. We developed these conditions so that the application of the averaging period contributes to the achievement of the ARORO.[552]

In assessing the service providers' proposed averaging periods, we applied the conditions we proposed in the Guideline, with one exception. The proposals from AusNet and some other service providers persuade us that one of the conditions we proposed is not necessary to achieve the ARORO. That condition was that averaging periods should be as close as practical to the commencement of each regulatory year. We remain of the view that the remaining Guideline conditions are important and necessary to promote the ARORO. Those conditions include that at the time the period is nominated all dates in the averaging period must take place in the future, and that all averaging periods should be specified prior to the commencement of the regulatory control or access arrangement period. These conditions, respectively, help to ensure that the return on debt resulting from the averaging period is unbiased and the annual debt update can be practically and automatically applied (as required by the rules).

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549 JEN, *Revised Regulatory proposal—Attachment 6-3: Averaging period proposal (confidential)*, January 2016; JEN, *Revised regulatory proposal—Attachment 6-1: Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 36–37; JEN, *Regulatory proposal—Attachment 9-3: Averaging period proposal (confidential)*, 30 April 2015; Acting General Manager–Regulation (JEN), *Letter to AER: Rate of return averaging periods for the 2016–2020 regulatory control period*, 10 July 2015 (Confidential); JEN, *Regulatory proposal—Attachment 9-2: Rate of return proposal*, 30 April 2015, pp. 101–102.

550 JEN, *Revised Regulatory proposal—Attachment 6-3: Averaging period proposal (confidential)*, January 2016.

551 AER, *Rate of return guideline*, December 2013, p. 21.

552 NER, cl. 6.5.2(c) and 6A.6.2(c); NGR, r. 87(3).

Table 3-19 sets out why we consider an averaging period that meets the remaining conditions in the Guideline contributes to the achievement of the ARORO. It also summarises our assessment of JEN's annual process for nominating debt averaging periods and its set of alternative averaging periods against these conditions.

Table 3-19 Assessment of proposed averaging periods against Guideline

Condition	Reasons for condition	Condition met?—annual nomination process	Condition met?—alternative averaging periods
Observed over a period of 10 or more consecutive business days up to a maximum of 12 months	Averaging daily estimates over a number of days smooths out short term volatility in the annually updated return on debt allowance.	Yes	Yes
It should be specified prior to the commencement of the regulatory control period.	This allows us to substantively assess the service provider's proposal. This avoids the practical difficulties with either (1) creating a new process for approving averaging period proposals or (2) assessing averaging period proposals during the annual pricing process, which is meant to be a compliance check that takes place over a short time frame.	No	Yes
At the time it is nominated, all dates in the averaging period must take place in the future.	If a regulated service provider can select an averaging period by looking at historical yields, it may introduce an upward bias.[553]	Yes	Yes
An averaging period needs to be specified for each regulatory year within a regulatory control period.	This allows for the annual debt update. The annual debt update reduces the potential for a mismatch between the allowed and actual return on debt for the benchmark efficient entity.	Not as yet	Yes
The proposed averaging periods for different regulatory years are not required to be identical but should not overlap.	This avoids double counting averaging periods. This would detract from our specification of the trailing average, which weights periods equally. Not requiring periods to be identical helps preserve confidentiality and provide service providers with a degree of flexibility.	Yes	Yes
The nominal return on debt is to be updated annually using the agreed averaging period for the relevant regulatory year.	This prevents a service provider from introducing bias by only updating annually using the agreed averaging period when it is advantageous for it to do so.	Not as yet	Yes
Each agreed averaging period is to be confidential.	This facilitates service providers organising their financing arrangements without market participants being aware of the averaging	Yes	Yes

[553] Lally, *Expert Report of Martin Thomas Lally*, 13 February 2011, pp. 9–10.

Condition	Reasons for condition	Condition met?—annual nomination process	Condition met?—alternative averaging periods
	periods. Accordingly, in practice we keep averaging periods confidential until they expire.		

Source: AER, *Rate of return guideline*, December 2013, pp. 21-22; JEN, *Revised Regulatory proposal—Attachment 6-3: Averaging period proposal (confidential)*, January 2016; JEN, *Revised regulatory proposal—Attachment 6-1: Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 36–37; AER analysis.

In assessing the service providers' (including JEN's) debt averaging period proposals, we have considered the timeframe within which each period should occur. In the Guideline, we proposed that service providers could nominate averaging periods of 10 or more consecutive business days up to a maximum of 12 months. However, the timing of the annual price/tariff variation process creates practical difficulties in implementing a 12 month averaging period that falls within a regulatory year. Therefore, we consider an averaging period for estimating the return on debt for regulatory year t should fall within the following timeframe:[554]

- end no later than 25 business days before a service provider submits its annual pricing proposal or reference tariff variation proposal for year t to the AER[555]
- commence no earlier than 12 months plus 25 business days before a service provider submits its annual pricing proposal or reference tariff variation proposal for year t to the AER.

We consider JEN's alternative averaging periods for 2017 to 2020 can be practically applied because they fall within this timeframe. We discuss this in more detail in the 'Annual debt update process' section.

Response to key issues raised by stakeholders

In our current regulatory processes, different service providers have proposed different methods for setting debt averaging periods during the regulatory control or access arrangement period. Many service providers have proposed more complicated approaches to nominating debt averaging periods in order to achieve greater flexibility. This is common to other aspects of the return on debt, such as the choice of third party data series. For example:

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554 This preferred timeframe does not apply to the first regulatory year in the regulatory control or access arrangement period. This is because the distribution determination or access arrangement will include the X factor for the first year, which will already incorporate the first year return on debt. Therefore, the annual debt update process will generally apply to the subsequent years of a regulatory control or access arrangement period.

555 However, we are open to individual service providers requiring a longer period (or requesting a shorter period) than 25 business days to accommodate their internal processes.

- Some service providers proposed to depart from the Guideline in relation to nominating all averaging periods before the start of the regulatory control or access arrangement period. Instead, these service providers proposed to nominate their averaging periods in a separate process each year. Within this, the service providers proposed different annual processes to nominate their averaging periods each year.
- AGN proposed separate averaging periods for the base rate and DRP components of the return on debt.
- AusNet nominated all averaging periods in its proposal, but departed from the Guideline in relation to nominating averaging periods that are as close as practically possible to the commencement of each regulatory year in its regulatory control period. Other service providers have implicitly departed from this Guideline condition by proposing a timeframe within which they can select an averaging period each year.

Table 3-20 summarises the different approaches to the nomination of debt averaging periods proposed by different service providers.

Table 3-20 Summary of service providers' averaging period proposals

Service Provider	Number of averaging periods nominated in revised proposal	Annual process for nominating averaging periods	Lag of one year in the annual update process	Separate averaging periods for DRP and base rate	Not as close as practically possible to start of each regulatory year
AusNet Services	All				X
United Energy	All				
JEN	First year only	X	X		X
CitiPower / Powercor	All				
ActewAGL	First year only	X	X		X
AGN	All			X	
Amadeus	All				

Source: AER analysis; AusNet, *Revised regulatory proposal*, 6 January 2016, p. 7-36; United Energy, *United Energy's revised regulatory proposal—nominated debt averaging periods (Confidential)*, 6 January 2016; United Energy, *Revised regulatory proposal*, 6 January 2016, p. 75; JEN, *Revised regulatory proposal—Attachment 6-1: Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 36–37; CitiPower, *Revised regulatory proposal*, 6 January 2016, p. 349; Powercor, *Revised regulatory proposal*, 6 January 2016, p. 343; ActewAGL, *Revised access arrangement proposal: Appendix 5.01—Detailed response to rate of return, gamma and inflation*, January 2016, pp. 46–47; AGN, *Revised access arrangement proposal—Attachment 10.26 Response to draft decision: Rate of return*, 6 January 2016, pp. 41–42; AGN, *Revised access arrangement proposal—Attachment 10.2A Response to draft decision: Averaging periods (Confidential)*, 6 January 2016; Amadeus, *Revised access arrangement proposal—Attachment E: Averaging periods (Confidential)*, 6 January 2016.

We remain of view expressed in the preliminary determination, that the range in the service providers' averaging period proposals suggests there is no single 'best' approach that is universally accepted. Our task is to determine a return on debt that is commensurate with the efficient financing costs of a benchmark efficient entity. Our task is not to provide a return that precisely matches each service provider's preferred financing strategies. Nevertheless, our approach provides a significant degree of flexibility for service providers to nominate an approach which allows them to organise their finances.

In this context, we take an approach to the nomination of debt averaging periods that is consistent across service providers in line with our task of setting a benchmark return. We consider that applying a consistent approach is more transparent and predictable, which benefits stakeholders. It also reduces the complexity and administrative costs associated with implementation. Our decision is that the service providers' averaging periods:

- should be nominated before the regulatory control or access arrangement period commences
- should not be separated into DRP and base rate averaging periods
- are not required to be as close as practically possible to the start of the each regulatory year, but should fall within a particular timeframe.

Each of these matters is discussed in more detail in section I.4 of Appendix I.

We have also received submissions from other stakeholders. For example, the CCP does not support the service providers' proposals to nominate an averaging period for each regulatory year just prior to that regulatory year, rather than at the start of the whole regulatory control or access arrangement period. It considers that this increases the complexity and opportunities for regulatory gaming.[556]

We note the Tribunal, in its recent decision for Jemena Gas Networks, upheld our approach to determining debt averaging periods. It stated:[557]

> The Tribunal is not satisfied that JGN's contention in this regard demonstrates that any ground of review is made out. It is the Tribunal's view that the AER's approach accorded with r 87(12) of the NGR requiring the annual return on debt to be determined through the automatic application of a formula specified in the Final Decision. It is an approach which accords a balance between flexibility and certainty in a sensible way, and so in a way that would promote efficient investment decisions including those responsible for managing risk in the arrangement of financial arrangements. The relevant service providers

556 CCP3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period: Attachment 1*, August 2015, p. 86.

557 Australian Competition Tribunal, *Application by Jemena Gas Networks (NSW) Ltd [2016] ACompT5*, 3 March 2016, para 87.

have the flexibility of nominating the length of their averaging periods. It is a process which it not overly complex.

Annual debt update process

Our decision is that an averaging period should occur within a timeframe of 10 business days to 12 months. This is consistent with the position we proposed in the Guideline.[558] We have considered how the process to annually update the return on debt would align with the publication of distribution prices.[559] The timing of publishing distribution prices affects how late an averaging period can end and still be implemented in practice.

Table 3-21 outlines the general process we propose to adopt for the annual debt update for distribution network service providers (distributors). Our assessment of the proposed averaging periods for distributors with current regulatory proposals or revised proposals has taken this process into account. We also propose to adopt this process for assessing the proposed averaging periods of other distributors in the future.

Table 3-21 Annual distribution debt update process

Step	Timing	Description of step	Reasons for timing
1	25 business days before a distributor submits its pricing proposal to us.	Averaging period ends on or before this date.	We determine the maximum practical end date of the averaging period from the timing of steps 2 and 3.
2	10 business days before a distributor submits its pricing proposal to us.	So the distributor can factor this into its annual pricing proposal, we inform it of updates on the return on debt, annual building block revenue requirement and X factor that incorporates the updated return on debt.	15 business days between steps 1 and 2 provides sufficient time for us to calculate (and provide quality assurance checks on the updated return on debt, revenue and X factor.
3	A distributor submits its pricing proposal to us on the date determined by the rules.	The distributor submits its pricing proposal to us for the relevant year.	10 business days between steps 2 and 3 is based on a service provider's advice regarding the minimum period it would require to factor the updated information into its prices. We are open to individual distributors requiring a longer period (or requesting a shorter period) to accommodate their internal processes. [560]

558 AER, *Better regulation—Rate of return guideline*, December 2013, p.21.

559 The electricity distribution service providers are required to submit to the AER a pricing proposal for each regulatory year of the regulatory control period. The gas distribution and transmission service providers are also required to submit to us an annual reference tariff variation proposal to meet the requirements of their specific access arrangements. As we are proposing to update service providers' allowed return on debt estimates on an annual basis, the updated annual return on debt estimates should be submitted and approved by us in advance of a service providers' annual pricing/tariff proposals. See: AER, *Explanatory statement to the draft rate of return guideline*, August 2013, p.103.

560 We note that a longer (or shorter) time period would move back (or forward) the maximum practical end date of the averaging period by the same timeframe.

Source: AER analysis.

On the basis of the process outlined in Table 3-21, we consider an averaging period for estimating the return on debt for regulatory year t should fall within the following timeframe:

- end no later than 25 business days before a distributor submits its annual pricing proposal for year t to the AER
- commence no earlier than 12 months plus 25 business days before a distributor submits its annual pricing proposal for year t to the AER.[561]

However, as set out in Table 3-21, we are open to individual distributors requiring a longer period (or requesting a shorter period) between steps 2 and 3 to accommodate their internal processes. We note that a longer (or shorter) time period would move back (or forward) the maximum practical end date of the averaging period by the same timeframe. For example, if a service provider requested 15 business days (instead of 10) for its internal processes, then its averaging period would need to end 30 business days (instead of 25) before the date the distributor must submit its annual pricing proposal to us.

The process outlined in Table 3-21 does not apply to the first regulatory year in the regulatory control period. This is because the distribution determination will include the X factor for the first year, which will already incorporate the first year return on debt. Therefore, this process will generally apply to the subsequent years of a regulatory control period.

In Table 3-21, we propose calculating the return on debt, annual building block revenue requirement, and X factor in accordance with the formula in the distribution determination. And we propose informing the distributor of our calculations before it submits its annual pricing proposal. We consider this preferable to the alternative approach, where we would assess updates the distributor calculated itself and submitted with its annual pricing proposal. This alternative approach could significantly complicate the annual pricing approval process if we identify calculation errors and require the distributor to revise all its proposed prices. On the other hand, our approach focusses the annual pricing approval process on how the distributor has incorporated the revised X factor into its prices, rather than also assessing the revised X factor itself.

The above process factors in the date that the rules require distributors to submit their annual pricing proposals to us.[562] In November 2014, the AEMC made a rule determination that affected this date.[563] The AEMC determined that:

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561 A further possible constraint on the start date is, as set out in the previous section, one of our conditions is at the time it is nominated all dates in the averaging period must take place in the future.

562 Clause 6.18.2(a)(2) of the NER requires electricity distributors to submit their annual pricing proposals to us at least 2 months before the commencement of the second and each subsequent regulatory year of the regulatory control period. For the Victorian distributors, each regulatory year commences at the start of the calendar year

- From 2017—distributors will be required to submit their annual pricing proposal to us by:[564]
  - 31 March each year (non-Victorian distributors)
  - 30 September each year (Victorian distributors).
- Before 2017—transitional arrangements will maintain the current date by which distributors must submit their annual pricing proposals.[565] This is by 1 May each year (non-Victorian distributors).[566] For Victorian distributors, the new rules apply from the second regulatory year (2017) of the 2016–2020 regulatory control period, accordingly there are no transitional arrangements that affect the timing of the annual debt update process.[567]

Response to key issues raised by stakeholders

JEN and ActewAGL proposed annual processes to nominate future averaging periods that can only be implemented with a lag of one year in the annual debt update process. However, these service providers' proposals did not specifically state that a lag of one year should apply.[568]

We do not agree with the submissions to incorporate a one year lag into in the annual debt update process. As set out above, our position instead is that an averaging period for regulatory year t should fall within the 12 months prior to 25 business days before submission of the annual pricing proposal or reference tariff variation proposal (for regulatory year t). We consider this approach is consistent with the requirements in the rules, which contributes to the achievement of the ARORO.[569] Our decision is based on the following reasoning:

- There are practical difficulties with allowing a one year lag in the annual debt update process. We considered this issue in the October 2014 proposed amendment to the PTRM.[570] We considered that the proposed PTRM could potentially handle a lag to the X factor change. However, we also considered that

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(1 January). For non-Victorian distributors, each regulatory year commences at the start of the financial year (1 July).

563 AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014.

564 See AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014, pp. 57, 95, 103. Victorian distributors will be required to submit their annual pricing proposals to us no later than 30 September. This is because the pricing process in Victoria operates on calendar years, rather than financial years.

565 AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014, p. 103.

566 AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014, pp. 103, 110–112 (transitional arrangements for Victorian distributors), 112–113 (transitional arrangements for non-Victorian distributors).

567 NER, transitional clause 11.76.1(c).

568 JEN*, Revised regulatory proposal—Attachment 6-1: Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 36–37; ActewAGL, *Revised access arrangement proposal: Appendix 5.01—Detailed response to rate of return, gamma and inflation*, January 2016, pp. 46–47.

569 NER, cl. 6.5.2(c) and 6A.6.2(c); NGR, r. 87(3).

570 AER, *Explanatory statement to the proposed amendment: Electricity transmission and distribution network service providers—Post-tax revenue models (version 3)*, 3 October 2014, pp. 16–17.

under a one year lag, 'the adjustment for the return on debt in year 5 would need to be implemented in the first year of the following regulatory control period, but it is unclear how this would occur'.[571] Our approach allows for a consistent and continuous practical implementation—both within a regulatory control or access arrangement period, and across multiple regulatory control or access arrangement periods.

- A one year lag allows for the return on debt for regulatory year t to be estimated over a period closer to that year, however, a one year lag increases the time before this estimate is incorporated into prices. This is because it is not possible to include the effect of year t's annual return on debt update in the pricing implementation for that year. We consider this mitigates some of the potential benefits of allowing the return on debt for regulatory year t to be estimated closer to that year. This would increase the mismatch between the allowed and incurred return on debt for a benchmark efficient entity because the allowed return on debt would only be updated to reflect the incurred return on debt one year later.[572]
- A one year lag adds further complexity and costs to the administration of regulation. We are not satisfied that there are benefits which outweigh the additional complexity resulting from the service providers' proposals. Given the existing complexity involved in the annual update process, a consistent approach across service providers is preferable to simplify the process where possible.

3.4.3 Gearing

Our decision is to adopt a 60 per cent gearing ratio. A 60 per cent gearing ratio is the same as the gearing ratio we proposed in the Guideline and adopted in the preliminary decision.

In the revised proposals currently before us, all of the service providers proposed a 60 per cent gearing ratio. We agree with that component of these proposals. However, we do not agree with the submissions by some of the service providers that the adoption of a 60 per cent gearing ratio is 'likely to lead to a conservative (low) estimate of the overall rate of return'.[573] In support for their submission, these service providers referred to a report by Frontier Economics.[574] However, in this report, Frontier

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[571] AER, *Explanatory statement to the proposed amendment: Electricity transmission and distribution network service providers—Post-tax revenue models (version 3)*, 3 October 2014, p. 17.

[572] NER, cl. 6.5.2(k)(1) and 6A.6.2(k)(1); NGR, r. 87(11)(1).

[573] CitiPower, *Revised regulatory proposal 2016–2020*, 6 January 2016, p. 384; Powercor, *Revised regulatory proposal 2016–2020*, 6 January 2016, p. 378; ActewAGL, *Revised 2016–21 access arrangement proposal: Response to the AER's draft decision, Appendix 5.01: Detailed response to rate of return, gamma and inflation*, 6 January 2016, p. 138; United Energy, *Response to AER preliminary determination—Re: rate of return and gamma*, 6 January 2016, p. 106; AGN, *2016/17 to 2020/21 Access Arrangement information: Response to draft decision, Attachment 10.26: Rate of return*, 6 January 2016, p. 83; AusNet Services, *Electricity distribution price review 2016–20: Revised regulatory proposal, Chapter 7: Rate of return & gamma*, 6 January 2016, pp. 103. APTNT and Jemena did not make this claim.

[574] Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016.

Economics clearly stated that it 'agree[s] with the AER's conclusion that the relevant evidence supports leverage of 60%'.[575]

The Energy Consumers Coalition of South Australia (ECCSA) submitted that our adoption of a 60 per cent gearing ratio together with a credit rating of BBB+ for a benchmark efficient entity is 'conservative and could include a higher gearing and/or a higher credit rating'.[576] ECCSA's view was based on analysis of the service providers' actual levels of gearing and actual credit ratings. Sub-panel 3 of the Consumer Challenge Panel (CCP3) also submitted that a 60 per cent gearing ratio is conservatively low and noted that there may be a disconnect between the gearing ratios and credit ratings of the service providers due to their uniquely stable cash flows.[577]

Overall, we are satisfied that a 60 per cent gearing ratio is commensurate with the efficient financing costs of a benchmark efficient entity. This is because a 60 per cent gearing ratio is supported by the industry average of a sample of firms that are comparable to the benchmark efficient entity.

Gearing is defined as the ratio of the value of debt to total capital (that is, debt and equity). There are benefits in using debt to fund investment. Debt is usually cheaper than equity and the use of debt also has tax advantages because borrowing costs are tax deductible. However, increased use of debt also increases the possibility that a business will experience financial distress, and in the worst case, bankruptcy. In theory, the optimal debt to equity ratio is the point at which business value is maximised, where the marginal benefits just offset the marginal cost of debt. While an optimal capital structure theoretically exists, the actual optimal value of debt and equity for any given business is dynamic and dependent on a number of business specific factors. Because of this uncertainty around the theoretically optimal gearing ratio, we primary rely on the average of a sample of firms that are comparable to the benchmark efficient entity. In other words, we assume that the industry is, on average, efficient and therefore use the industry average to guide our regulatory benchmark.

We consider that the empirical evidence supports a gearing of 60 per cent. Average gearing levels from the 2009 WACC review are presented in the following table, as are the Bloomberg market valuations using more recent data and Standard and Poor's book valuations. We observe that the average level of gearing across the four different approaches has a range of 59 to 66 per cent. Accordingly, we propose to maintain the currently adopted benchmark efficient level of gearing of 60 per cent.

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575 Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 22 (fn. 23).

576 ECCSA, *A response to the Australian Energy Regulator draft decision on Australian Gas Networks AA2016 revenue reset*, February 2016, p. 34.

577 CCP3, *Submission to the AER: Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for a revenue reset for the 2016–2020 regulatory period*, February 2016, pp. 83, 94-95.

Table 3-22 Averaging gearing ratio—Comparator set of firms

Year	2009 WACC review 2002–2007[a]	Bloomberg (market value) 2002–2012 (full sample)[b]	Bloomberg (market value) 2002–2012 (refined sample)[c]	Standard and Poor's (book value) 2008–2012[d]
2002	65.1	54.5	65.8	N/A
2003	64.8	51.8	60.5	N/A
2004	61.7	51.2	55.1	N/A
2005	64.6	51.2	62.6	N/A
2006	63.0	56.6	61.9	N/A
2007	60.5	57.6	57.6	N/A
2008	N/A	68.3	68.3	70
2009	N/A	68.8	68.8	69
2010	N/A	65.5	65.5	66
2011	N/A	63.2	63.2	62
2012	N/A	60.6	60.6	65
Average	63.3	59.0	63.1	66

Source: AER analysis.

Notes: (a) AER, *Final decision: Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC) parameters*, 1 May 2009, p. 124.

(b) Analysis including full sample of businesses.

(c) AGL, Alinta and GasNet excluded from the analysis.

(d) ERA, *Explanatory statement for the draft rate of return guidelines*, 6 August 2013, p. 49.

The benchmark gearing ratio is used:

- to weight the expected required return on debt and equity to derive a WACC
- to re-lever the asset betas for the purposes of comparing the levels of systematic risk across businesses, and
- as a factor in estimating the benchmark credit rating.[578]

[578] That is, if a service provider had a gearing ratio that was significantly different to the benchmark gearing ratio, then we would consider any implications of this for including that service provider within the sample used to estimate the industry median credit rating.

3.4.4 Expected inflation rate

Our estimate of expected inflation is set out in Table 3-23. We base our approach on an average of the RBA's short term inflation forecasts and the mid-point of the RBA's inflation targeting band.

This method is consistent with what we have previously adopted and applied since 2008, as well as JEN's regulatory proposal and our preliminary decision (the current method).[579] We consider the current method to be a reasonable estimation method for the following reasons:

- RBA research indicates that its one year inflation forecasts have substantial explanatory power.[580]
- To the extent that the historical success of RBA monetary policy informs market consensus inflation expectations, the mid-point of the RBA's inflation targeting band would reflect longer term inflation expectations. We note that since inflation rate targeting in 1993, the average annualised inflation rate has been approximately 2.6 per cent, which is close to the 2.5 per cent midpoint of the target band.
- Evidence indicates that the RBA's control of official interest rates and commentary has an impact on outturn inflation and inflation expectations.[581]
- This method is simple, transparent, easily replicated and unlikely to be subject to estimation error.

In the preliminary decision, we noted our expectation that the RBA would publish a more recent inflation forecast before our final decision, and that we will update the value of the expected inflation rate accordingly in the final decision.[582] Consistent with our preliminary decision, our final decision reflects updated RBA forecasts from May 2016.

Table 3-23 AER estimate of expected inflation (per cent)

Expected inflation	2016	2017	2018 to 2025	Geometric average
AER preliminary decision	2.5 [a]	2.5 [a]	2.5	2.50
AER final decision update	1.5 [b]	2.0 [b]	2.5	2.32

579 AER, *Preliminary decision Jemena distribution determination, Attachment 3 Rate of return*, October 2015, pp. 256–7; JEN, *Regulatory Proposal: Attachment 9-2 Rate of return proposal*, 30 April 2015, p. 110.

580 Further, RBA forecasts have been marginally more accurate than private sector forecasts. Tullip, P., Wallace, S., 'Estimates of uncertainty around the RBA's forecasts', *RBA Research Discussion Paper – November 2012*, RDP2012-07, p. 30.

581 AER, *Final decision: SP AusNet transmission determination 2008–9 to 2013–14*, January 2008, pp. 103–4; RBA, *Letter to ACCC*, 9 August 2007, p. 3; Australian Treasury, *The Treasury bond yield as a proxy for the CAPM risk-free rate, Letter to ACCC*, 7 August 2007, p. 5.

582 AER, *Preliminary decision Jemena distribution determination, Attachment 3 Rate of return*, October 2015, p. 256.

Source: RBA, *Statement on Monetary Policy*, August 2015, p. 67; RBA, *Statement on Monetary Policy*, May 2016, p. 61.

(a) In August 2015, the RBA published a range of 2–3 per cent for its December 2016 and December 2017 CPI inflation forecasts respectively. Where the RBA published ranges, we select the mid-points.

(b) In May 2016, the RBA published a range of 1–2 per cent and a range of 1.5–2.5 per cent for its December 2016 and December 2017 CPI inflation forecasts respectively. We select the mid-point from this range.

JEN proposed the current method in its initial regulatory proposal. However, it also noted that, 'expectations concerning inflation (or in fact fears of significant deflation) appear to be volatile and it may be that the best method for estimating inflation may evolve during the period that our revenue proposal is being considered'.[583] The initial regulatory proposal did not explain this further or indicate how 'the best method' might evolve.

In its revised regulatory proposal, JEN departed from the current method.[584] It now proposes an estimate of expected inflation of 2.19 per cent using CEG's application of the breakeven approach. However, it also submits that this is higher than the 'best estimate' which would also entail estimating expected inflation for five and 10 years using a combination of observed inflation, and deriving a 60/40 weighted average of these five and 10 year estimates.[585] This would produce an estimate of 1.94 per cent.[586]

We do not accept this revised proposal or accept JEN's submission that 1.94 per cent would be the 'best estimate'. This is because we consider that the only relevant inflation expectation is one that matches the term of our allowed rate of return (that is, 10 years). We do not consider CEG's application of the breakeven approach appropriately adjusts for bias. Further, we do not consider that a breakeven approach using indexed CGSs would necessarily produce better estimates of expected inflation than the current method (or another estimation method, such a one based on inflation swaps).[587]

583 JEN, *Regulatory Proposal: Attachment 9-2 Rate of return proposal*, 30 April 2015, p. 110.

584 JEN, *Revocation and substitution submission, Attachment 6-1 Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 111

585 JEN, *Revocation and substitution submission, Attachment 6-1 Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 122.

586 CEG, *Revocation and substitution submission, Attachment 6-10 CEG September 2015 cost of debt and inflation forecasts*, January 2016, p. 3. These estimates are based on the 20 business days to 30 September 2015.

587 We consider we would need to adjust for biases if we estimated breakeven expected inflation using either interest swaps or indexed CGSs. However, some evidence indicates that inflation swaps might produce better estimates than indexed CGSs. For instance, in February 2015, the RBA noted that fluctuations in market liquidity affect the inflation swap market less than the indexed CGS market. See RBA, *Statement on Monetary Policy*, February 2015, p. 50. The RBA previously found inflation swaps tend to be a more useful source of information on expected inflation in practice since (as of March 2012) there were few indexed CGS on issue and that the indexed CGSs were somewhat less liquid than nominal CGSs. While the supply of indexed CGS has increased since the RBA's finding, the liquidity of indexed CGS relative to that of nominal CGS appears not to have improved considerably. See; Finlay, R., Olivan, D., 'Extracting Information from Financial Market Instruments', *RBA Bulletin*, March Quarter 2012, pp. 45-46.

Moreover, even if we considered an alternative approach was preferable to the current method (which we do not), the method for estimating expected inflation should apply to all service providers as inflation expectations are not business-specific. As such, any change in approach should only be considered following broad consultation with all stakeholders, rather than within a single reset. Moreover, the method for estimating expected inflation is defined in the post-tax revenue model (PTRM) and changing this should be done in accordance with distribution consultation procedures. [588]

Response to CEG's approach

In its revised regulatory proposal, JEN proposed that CEG provided the best estimates of expected inflation. We do not consider that CEG's approach produces better estimates of expected inflation than the current method. CEG's method entails:[589]

- On the basis that CEG thinks that, for the return on debt, we should use a five year inflation expectation matching the regulatory control period:
  - Adopting a 60/40 weighted average estimate of five and 10 year inflation expectations, rather than a 10 year inflation expectation.
  - Where available, using observed inflation in its estimate of a five year inflation expectation.
- Estimating expected inflation using its application of the breakeven approach, rather than using the current method based on RBA forecasts.

We do not agree with CEG's opinion that the relevant estimate of expected inflation for the return on debt is the regulatory control period. Rather, we find that the relevant estimate of expected inflation is for a 10 year horizon.

We are not satisfied that using the breakeven approach would improve the quality of our estimates of expected inflation. We consider there are limitations to the breakeven approach that JEN has not discussed or proposed to address.

We elaborate on these positons in the following sections.

An expectation matching the regulatory control period

We do not agree with CEG's opinion that the relevant estimate of expected inflation for the return on debt is the regulatory control period. As such, we do not accept with CEG's suggestion to adopt an estimate that is 60/40 weighted average of five and 10 year expected inflation, using observed inflation where available to calculate the five year expectation.[590]

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[588] As required by of cll. 6.16 and 6A.20 of the NER.

[589] CEG, *Memorandum, September 2015 cost of debt and inflation forecasts to HEN, AusNet Services, CitiPower and Powercor*, 5 January 2016; CEG, *Measuring expected inflation for the PTRM*, January 2016.

[590] CEG, *Memorandum, September 2015 cost of debt and inflation forecasts to HEN, AusNet Services, CitiPower and Powercor*, 5 January 2016, p. 3; CEG, *Measuring expected inflation for the PTRM*, January 2016, p. 14.

It is both internally consistent and necessary to use a 10 year inflation expectation to convert a nominal return on debt with a 10 year term to a real return on debt with a 10 year term. Debt contracts are based on prices investors are willing to pay. These prices reflect investor expectations of the risk free rate, debt risk premium and inflation over their investment horizon at the time they raise this debt. Service providers, including JEN agree that this horizon (or term) for the return on debt is 10 years.[591] Therefore, while debt contracts may fix the nominal cost of debt, this cost incorporates investor expectations of inflation over the next 10 years.

Our position is consistent with what CEG has supported in the past and it is not clear to us why it has since changed its position. In 2008, CEG submitted that the correct measure of expected inflation for converting nominal returns into real returns is expected inflation over the life of the 10 year nominal CGS bond from which the inflation estimate is being removed.[592] While we no longer explicitly use 10 year nominal CGS bonds to estimate return on debt, our estimate of a 10 year forward looking return on debt implicitly reflects a 10 year forward looking nominal risk free rate. We can express this algebraically as:

$$Expected[RoD_{\ nominal,\,10\ years}] = Expected\ [rf]_{\ nominal,\,10\ years} + Expected[DRP_{\ 10\ years}]$$

Where: RoD = Return on debt

rf = risk free rate

DRP = debt risk premium

Our position is also consistent with what NERA has advised service providers in the past when it submitted:[593]

> inflation rate forecast horizon should match the term of the nominal government bond rate [that is,10 years] used in the calculation of the weighted average cost of capital (WACC). This practice is consistent with the fundamental principle established by the Fisher equation which in effect states that the nominal bond rate encapsulates the market's expectations of the inflation that is expected to prevail over the life of the security in question.

The breakeven approach

Our final decision is to apply the current method rather than to use CEG's breakeven estimates. Even though we recognise there may be benefits to using a breakeven approach, we also recognise:

- There are strengths and limitations to both the current method and breakeven approaches. Given the information currently before us, we are not satisfied that changing our approach would improve our estimates of expected inflation.

[591] JEN proposes the AER adopt a 10 year term in *Revocation and substitution submission: Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 29.

[592] CEG, *A methodology for estimating expected inflation: A report for ElectraNet*, 17 January 2008, p. 3.

[593] NERA, *AER SP AusNet draft determination: Inflation expectations - TransGrid*, November 2007, pp. 4–5.

- There are clear limitations to using breakeven approaches that result in biased estimates of expected inflation unless particular adjustments are made to these estimates. JEN has not put any material before us to discuss these limitations or propose how to adjust for them.
- Market imperfections can undermine the ability of breakeven approaches to estimate the market's inflation expectations. CEG recognises this in its recent advice.[594] It has also recognised this in the past when advising that it was generally reasonable to use RBA forecasts.[595] CEG also advised that its estimate of expected inflation using the breakeven approach (at that time) was, 'at odds with credible forecasts by the RBA and all other macro-economic experts'.[596] While CEG has indicated that this is not a material concern in the current market, we find its analysis unconvincing for reasons discussed below.

Changing approaches may not improve estimates

We do not consider that reverting to a breakeven approach is likely to improve our estimates of expected inflation. We recognise that both the current method and breakeven approaches have benefits and limitations, as summarised in Table 3-24.

Table 3-24: Comparison of the current method and breakeven approach

Approach	Benefits	Limitations
The current method : A geometric average of the RBA forecast and mid-point.	This is simple, transparent and easily replicated. Since the current method is not subject to estimation bias or error it may improve regulatory certainty and reduce the scope for gaming. This relies on RBA 2 year forecasts – RBA's research suggests that its 1 year forecasts of inflation have substantial explanatory power and in the past RBA forecasts have been marginally more accurate than private sector forecasts.[597] Since inflation rate targeting in 1993, the average annualised inflation rate has been approximately 2.6%, which is close to the 2.5% midpoint of the target band. To the extent that the historical success of RBA monetary policy informs market-consensus expectations of inflation, the current approach may be a reasonable estimate of longer term inflation expectations. There is evidence to suggest that the RBA's control of official interest rates and commentary	If monetary policy loses or is perceived to have lost its effectiveness in influencing economic activity, inflation expectations may deviate systematically from the mid-point of the inflation target range. In which case, estimates under this approach may be too high or too low relative to the market inflation expectations. The current approach is more likely than market-based estimates to be inconsistent with the term structure of inflation observed in the market because it is not based on the market-implied forward inflation curve. This raises the risk that estimates of the real risk free rate may depart from the 'true' real risk free rate in the market.

594 CEG, *Measuring expected inflation for the PTRM*, June 2015, p. 7.

595 CEG, *Expected inflation estimation methodology: A report for Country Energy*, April 2008, pp. 4.

596 CEG, *Expected inflation estimation methodology: A report for Country Energy*, April 2008, pp. 4.

597 Tullip, P., Wallace, S., 'Estimates of uncertainty around the RBA's forecasts', *RBA Research Discussion Paper – November 2012*, RDP2012-07, p. 30.

	has an impact on outturn inflation and inflation expectations.[598]	
The breakeven approach: The breakeven inflation rate implied by comparing CPI-indexed CGS and nominal CGS.	These estimates include market-consensus expectations of inflation that is based on an aggregation of most up-to-date, relevant and available information.	We moved away from using this approach in the past as it was recognised that bias existed in indexed CGS yields. The breakeven approach can be a misleading proxy for expected inflation unless various biases are identified and removed. Potential sources of bias include the effect of bond convexity; inflation risk premia, liquidity premia, and inflation indexation lag on nominal and/or indexed bond yields.

Other limitations and potential biases to the breakeven approach

There is no straightforward way of employing a breakeven approach. Rather, breakeven estimates require adjustment to account for several different types of bias.[599] Table 3-30 highlights some of these potential biases based on preliminary research.

Table 3-25: Potential biases under the breakeven approach

Potential bias	Effect on estimates	Explanation	Adjustment needed?
Convexity	Underestimate	Differences in convexity and convexity bias between indexed and nominal bonds mean that the implied breakeven inflation rate may differ from inflation expectations. Convexity bias results in a downward bias of bond yields and nominal bond yields are generally more downwardly biased than indexed bond yields. This is because convexity bias is sensitive to yield volatility and nominal bond yields are generally more volatile than indexed bond yields. As a result, the differences in bond convexity bias could bias long-term breakeven inflation rates below inflation expectations. [600]	Yes
Inflation risk premium	Generally an overestimate. Potential	Nominal bondholders will demand compensation for inflation risk as the actual inflation rate may not match the expected inflation rate. The	Yes, if our goal is to only estimate expected inflation. No, if our goal is to convert

598 AER, *Final decision: SP AusNet transmission determination 2008–9 to 2013–14*, January 2008, pp. 103–4; RBA, *Letter to ACCC*, 9 August 2007, p. 3; Australian Treasury, *The Treasury bond yield as a proxy for the CAPM risk-free rate, Letter to ACCC*, 7 August 2007, p. 5.

599 For example, see Barne, M.L.; Bodie, Z.; Triest, R.K.; Wang, J.C., 'A TIPS scorecard: are they accomplishing their objectives?', *Financial Analysts Journal*, Vol. 66, No. 5, 2015, p. 70; D'Amico, S., Kim, D.H., Wei, M., 'Tips from TIPS: the informational content of Treasury inflation-protected security prices', *Federal Reserve Board*, Washington D.C., 2010–19 (Version December 2009), p. 2.

600 Scholtes, C., 'On market-based measures of inflation expectations', *Bank of England Quarterly Bulletin*, Spring 2002, p. 71.

	underestimate if there are concerns about deflation or very low inflation.[601]	implied breakeven inflation rate is likely to exceed the expected inflation rate if there is an inflation risk premium in nominal bond yields. However, if there are concerns about deflation, the inflation risk premium may become negative and the breakeven inflation rate may underestimate expected inflation.	a nominal rate of return with an inflation risk premium into a real rate of return for a business with no inflation risk.
Liquidity premium	Underestimate	The indexed bond market is likely to be less liquid than the nominal bond market and as a result the breakeven inflation rate is likely to include a liquidity premium. The differential liquidity premium between nominal and indexed bonds may also be time-varying. This premium is likely to be greater during periods of uncertainty when there is a 'flight' to more liquid nominal bond markets.[602] This would result in a narrow spread between nominal and indexed bond yields caused by greater uncertainty rather than a fall in expected inflation. If we accept CEG's forecasts of weak economic activity and an 'inflation trap', any resulting financial market uncertainty may give rise to a large liquidity premium in the breakeven inflation rate.	Yes
Inflation indexation lag	Underestimate or overestimate – potentially small if inflation is stable and the indexation lag is small.	Indexed CGS yields reflect some historical inflation as there are lags between movements in the price index and adjustments of indexed bond cash flows.[603] The indexation lag on indexed CGS is considerable - between 4.5 and 5.5 months. As a result of indexation lag, if historical inflation is high (low) relative to the inflation rate expected by the market then, all else equal, the real yield to maturity on the indexed bond may be higher	Potentially not if immaterial.

601 Examining the US bond market over 2000 to 2008, Grishchenko and Huang (2012) found the inflation risk premium to range from -0.16 to 0.10. They attributed the negative inflation risk premium embedded in nominal bonds to the deflation scare of 2002-2003 and the illiquidity of indexed bonds. Grishchenko, O., Huang, J.Z. (2012), 'Inflation Risk Premium: Evidence from the TIPS market', Finance and Economics Discussion Series Divisions of Research and Statistics and Monetary Affairs, Federal Reserve Board, Washington, D.C. 2012-06, pp. 1-46. Campbell and Shiller also found that with inflation positively correlated with stock prices during the US economic downturn (2009), the inflation risk premium in nominal Treasury bonds is likely negative. See Campbell, J., Shiller, R., Viceira, L. (2009), 'Understanding Inflation-Indexed Bond Markets', *Brookings Papers on Economic Activity*, Spring 2009, p. 115.

602 Shen, P., Corning, J., 'Can TIPS Help Identify Long-Term Inflation Expectations?', *Federal Reserve Bank of Kansas City, Economic Review*, Fourth Quarter 2001, pp. 61¬87.

603 The RBA observed that because indexed CGS are indexed with a lag (of 4.5 to 5.5 months), indexed CGS yields also reflect historical inflation not just future expected inflation. The RBA noted because of indexation lag, the high realised inflation rate during 2008 was reflected in the narrow breakeven inflation rate of 90 basis points during that year (based on a 2 year breakeven inflation rate), although other potential causes of the narrow breakeven rate were also identified, such as a possible increase in indexed bond liquidity premia. The RBA had undertaken modelling to remove the index lag distortion from indexed bond yields in their estimation of expected inflation from the implied breakeven inflation rate. Finlay, R, Wende, S., 'Estimating Inflation Expectations with a Limited Number of Inflation-indexed Bonds', *Research Discussion Paper: Reserve Bank of Australia*, RDP 2011-01, March 2011, pp. 17–18, 20.

	(lower) than its 'true' real yield and the breakeven approach may underestimate (overestimate) the expected inflation rate. Also, due to indexation lag, the real return on indexed bonds may be exposed to some inflation risk and may include an inflation risk premium.[604]

It is worth noting that the potentially material biases in Table 3-25 have yet to be raised or discussed. This provides further support for broad consultation with all stakeholders prior to changing approaches as this would illicit stakeholder input to the various benefits and limitations to a change in approach. For instance, there is a range of limitations to the breakeven approach that CEG and JEN did not raise and stakeholders may be yet to consider.[605] Where possible, it would be prudent to adjust for any identifiable material biases if such a review lead us to adopt the breakeven approach (or another method, such as one based on interest rate swaps).

Limitations under market imperfections

Market imperfections can undermine the ability of the breakeven approach to estimate the market's inflation expectations. For this reason, our use of the breakeven approach pre-2008 had been criticised by various stakeholders.[606] Also, CEG recently recognised this in advising:[607]

> in the period from 2006 to late 2008 the indexed CGS market was much smaller than today. RBA analysis suggested that the limited supply, in combination with heightened demand by foreigners due to regulatory changes, were combining to push up indexed CGS prices and push down real yields; with the effect that breakeven inflation estimates were overstated.

CEG suggests that its criticism of the breakeven approach in 2007 does not apply to the current market. However, we do not consider it has provided convincing evidence of this. We agree with CEG's observation that there has been an increase in the size of

604 Grishchenko and Huang found the indexation lag of 3 months for 10 year indexed US treasuries added over 4 basis points to real yields. Grishchenko, O., Huang, J.Z., 'Inflation Risk Premium: Evidence from the TIPS market', *Finance and Economics Discussion Series Divisions of Research and Statistics and Monetary Affairs*, Federal Reserve Board: Washington D.C., 2012, pp. 1–46.

605 CEG, *Measuring expected inflation for the PTRM*, January 2016.JEN did not raise these limitations in JEN, *Revocation and substitution submission Attachment 6-1 Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 106–112,

606 CEG, *Expected inflation estimation methodology: A report for Country Energy*, April 2008; Commonwealth Treasury, *Letter to Joe Dimasi, ACCC, 'The Treasury Bond Yield As a Proxy For the CAPM Risk-Free Rate'*, 7 August 2007; NERA, *Bias in the indexed CGS yields as a proxy for the CAPM risk free rate: A report for the ENA*, March 2007; RBA, *Letter to Joe Dimasi, ACCC, Comments on a report prepared by NERA concerning the Commonwealth Government bond market*, 9 August 2007.

607 CEG, *Measuring expected inflation for the PTRM*, June 2015, pp. 6–7.

the indexed CGS market (there are currently seven types of indexed CGS on issue).[608] However, we do not consider this means that market distortions are no longer a concern.

For instance, despite having improved since 2007, the size and liquidity of the indexed CGS market is still limited.[609] Further, increased *absolute* liquidity in the indexed CGS market does not necessarily imply that this market has become more liquid *relative* to the nominal CGS market. This is important because relative liquidity between these two markets determines the liquidity bias in implied breakeven rates. Trading volume of indexed CGS expressed share of total indexed and nominal CGS can be used as a measure of the relative liquidity.[610] According to this metric, there has only been a minor improvement to relative liquidity of the indexed CGS since early 2008.[611] Liquidity bias can be material and difficult to identify and remove from the breakeven rate—particularly as evidence indicates that it can vary considerably over time.[612]

Further, while CEG suggests the current approach is producing unusual results, it is not clear that this is the case. Another market-based method for estimating expected inflation entails using inflation swaps. CEG's application of this method showed that a 10 year inflation expectation of approximately 2.6 per cent, which was higher than what the current approach produced at that time (2.5 per cent). While CEG advised that hedging costs cause an upward bias in inflation estimates from swaps, it is worth noting that the breakeven approach is not free from bias either.[613] Inflation swaps also have some advantages over the breakeven approach. For instance, the Treasury, the RBA and several academic researchers observe that, as estimates of expected

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608 Australian Office of Financial Management, 'Treasury Indexed Bonds', 19 February 2016, accessed 25 February 2016, <http://aofm.gov.au/ags/treasury-indexed-bonds/#Treasury_Indexed_Bonds_on_issue>.

609 Devlin, W., Patwardha, D., 'Measuring market inflation expectation', *Economic Roundup*, No. 2, 2012, p. 7.

610 In their estimate of the liquidity premia in the breakeven inflation rate, Gurkaynak et al (2010) employed trading volume of indexed Treasuries expressed share of total indexed and nominal Treasuries to measure of the relative liquidity of indexed US Treasuries. See Gurkaynak, R., Sack, B., Wright, J. (2010), 'The TIPS Yield Curve and Inflation Compensation', *American Economic Journal: Macroeconomics*, 2(1), pp. 70-92

611 The annual trading volume of indexed CGS as a share of total CGS more than doubled in 2007-08, but returned to its 2007-08 share in 2011-12 as new tranches of nominal CGS were issued. Currently, the share is only modestly above 2007-08 levels. See data reported in AFMA, *2015 Australian financial markets report*, pp. 20–21; AFMA, 2012 *Australian financial markets report*, pp. 18–20.

612 For instance, see Gurkaynak, R., Sack, B., Wright, J. (2010), 'The TIPS Yield Curve and Inflation Compensation', *American Economic Journal: Macroeconomics*, 2(1), pp. 87-89; Shen, P., Corning , J. (2001), 'Can TIPS Help Identify Long-Term Inflation Expectations?' Federal Reserve Bank of Kansas City, *Economic Review*, Fourth Quarter, p. 76.

613 CEG, *Measuring expected inflation for the PTRM*, January 2016, p. 13; CEG, *Measuring expected inflation for the PTRM*, June 2015, pp. 16–17. CEG references Devlin, W., Patwardha, D., 'Measuring market inflation expectation', *Economic Roundup*, No. 2, 2012. This states: 'while inflation swap rates generally move closely in line with bond market break-evens, they have typically been around 20 basis points higher at the 10-year tenor', p. 14. However, it also discusses how the breakeven approach has competing biases that vary, particularly over longer time periods (pp. 10–11).

inflation, inflation swap rates are less affected by liquidity premia than the bond breakeven inflation rate.[614]

Amending methods in the future

This section sets out policy and legal considerations that we would take into account if we were to amend our approach in the future. Specifically:

- Amending the inflation methodology must be done in the PTRM. Since the PTRM applies to all service providers (and because this is specified in the NER), any amendments to the PTRM must be made in accordance with the distribution consultation procedures.
- We consider there are benefits in maintaining a methodology that we consider to be sound and that stakeholders broadly agree upon (to the extent possible). The material before us does not indicate that service providers would broadly support adopting a different methodology for estimating inflation expectations.[615]

Amending the post-tax revenue model

Any changes/amendments to the PTRM, which would apply to all service providers, must be done in accordance with the distribution consultation procedures.[616] This applies to inflation, which is addressed through the PTRM rather than the rate of return (which is to be in nominal terms).[617] In contrast to this position, CEG advised that we need not reflect different estimates of expected inflation in the PTRM, but could also reflect this in the nominal cost of equity and debt or the RAB roll forward model.[618] We note that similar to the PTRM, we may only amend or replace the role forward model in accordance with distribution consultation procedures.[619] Also, we do not consider the

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614 Devlin, W., Patwardha, D., 'Measuring market inflation expectation', *Economic Roundup*, No. 2, 2012, p. 11; RBA, *Statement on Monetary Policy*, February 2015, p. 50; Haubrich, J., Pennachi, G., Ritchken (2012), 'Inflation Expectations, Real Rates, and Risk Premia: Evidence from Inflation Swaps', *The Review of Financial Studies*, 25(2), pp. 1590; Fleckenstein, M., Longstaff, F., Lustig, H. (2014), 'The TIPS-Treasury Bonds Puzzle', *The Journal of Finance*, 69(5), October, pp. 2165-2167. This was also observed by Campbell et al. (2009) during the height of the financial crisis. Campbell, J., Shiller , R., Viceira, L. (2009), 'Understanding Inflation-Indexed Bond Markets', *Brookings Papers on Economic Activity*, Spring 2009, p. 109.

615 For instance, when developing the Guideline in 2013, stakeholders endorsed continuing the current method. See AER, *Draft Rate of Return Guideline, Explanatory Statement*, August 2013, p.152. Since that time, a number of service providers did not raise concerns with our current approach (For example: Amadeus Gas Pipeline, ActewAGL electricity distribution, Ausgrid, Directlink, Endeavour Energy, Energex, Essential Energy, Ergon Energy, JGN, TasNetworks, TransGrid). Since that time, a number of service providers raised concerns with the current approach but only proposed to depart from it in their revised proposals (For example: ActewAGL gas distribution, AGN, AusNet Services, JEN, SAPN and United Energy). CitiPower and Powercor raised concerns with the current approach but did not propose to depart from it in their revised proposals.

616 NER, cl 6.4.1(b) & 6A.5.1(b).

617 NER, cl.6.4.2(b)(1) and (4), NER, cl.6.5.2(d)(2). See our decision on SAPN for a discussion. AER, *Final decision: SA Power Networks determination attachment 3 – Rate of return*, October 2015, pp.253–4.

618 CEG, *Measuring expected inflation for the PTRM*, January 2016, p. 18.

619 See NER 6.5.1(c). Similar wording is provided for transmission under NER 6a.6.1(c). CEG also recognises this in *Measuring expected inflation for the PTRM*, January 2016, p. 23.

NER allow us to adjust the nominal vanilla rate of return to be higher than what would be commensurate with the efficient financing costs of a benchmark efficient entity.[620]

CEG considered our reasoning for only amending our method for estimating expected inflation in accordance with the distribution consultation procedures to be inconsistent with our decision on TransGrid's debt raising costs, where:[621]

> the AER has explicitly relied on what it regards as overcompensation built into the timing assumptions of the PTRM in order to not compensate for the efficient costs associated with meeting Standard and Poor's requirements around liquidity and prefunding debt .

We do not agree with CEG's characterisation of our decision on TransGrid's debt raising costs. In its regulatory proposal, TransGrid requested additional debt raising costs based on its need to have excess money available to re-finance debt in advance and to maintain a certain level of liquidity.[622] Our response was that we, in effect, already compensated TransGrid for this cost as the PTRM's timing assumptions provide adequate compensation for the timing of revenue compared to expenses.[623] That is, TransGrid was already compensated for the particular revenue it was requesting.

Maintaining a sound methodology

We consider there are good reasons for maintaining a methodology for estimating inflation expectations that is broadly accepted as sound rather than changing approaches across resets (noting that we do not consider service providers have shown broad support to permanently return to the breakeven approach).[624] This is because:

The method that we determine is likely to result in the best estimates of expected inflation must be contained in the PTRM.[625] The rules specify that we may amend the

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620 The NER requires us to determine the allowed rate of return on a nominal vanilla basis, NER 6.5.2(d)(2). This must be determined such that it achieves the ARORO, NER 6.5.2(b).

621 CEG, *Measuring expected inflation for the PTRM*, January 2016, p. 5.

622 TransGrid, *Revenue proposal*, May 2014, pp. 131–132. TransGrid based its proposal for debt raising costs on Incenta Economic Consulting, *Debt raising transaction costs–TransGrid*, May 2014, p. 10.

623 AER, *Draft decision TransGrid transmission determination 2015–16 to 2017–18, Attachment 3: rate of return*, November 2014, p. 327.

624 For instance, when developing the Guideline in 2013, stakeholders endorsed continuing the current method. See AER, *Draft Rate of Return Guideline, Explanatory Statement*, August 2013, p.152. Since that time, a number of service providers did not raise concerns with our current approach (For example: Amadeus Gas Pipeline, ActewAGL electricity distribution, Ausgrid, Directlink, Endeavour Energy, Energex, Essential Energy, Ergon Energy, JGN, TasNetworks, TransGrid). Since that time, a number of service providers raised concerns with the current approach but only proposed to depart from it in their revised proposals (For example: ActewAGL gas distribution, AGN, AusNet Services, JEN, SAPN and United Energy). CitiPower and Powercor raised concerns with the current approach but did not propose to depart from it in their revised proposals.

625 6A.5.3(b)(1).

PTRM in accordance with distribution consultation procedures.[626] It is valuable to follow distribution consultation procedures in amending this aspect of the PTRM because the method for estimating expected inflation applies to all service providers.

Regularly switching between different methods for estimating inflation expectations could allow bias to enter our decisions as this would incentivise service providers to propose approaches that were most beneficial to them at a given point in time. If an alternative to the current method provides unambiguously better estimates of expected inflation, we consider it preferable to adopt this as our general approach rather than applying it on a decision-by-decision basis.

We do not consider that service providers or other stakeholders have shown broad support to permanently return to the breakeven approach. In 2013, stakeholders endorsed continuing the current method when we raised this as an issue for potential review of our regulatory approach.[627] JEN submitted that stakeholders endorsed continuing the current method in 2013 because it produced similar estimates to the breakeven approach at the time.[628] We do not find this convincing. Recognising that different methods produce different estimates across time, we consider stakeholders would have supported the estimation method they considered was most reasonable. We would accept that stakeholders might change their preferences if liquidity in the indexed CGS market improved notably since 2013 and/or less biases and premia were affecting the breakeven inflation rate more generally. However, this does not appear to be the case.

More specifically, we do not consider CEG or JEN have made a strong case for the breakeven approach being fundamentally superior. Rather, CEG considers the current method to be broadly reasonable in most market circumstances.[629] CEG also noted that: [630]

> I consider that there have been some periods in the past when the AER's method has resulted in a better estimate of expected inflation than market based estimates (such as breakeven inflation measured as the difference in yields between nominal and CPI indexed CGS).

Given the above points, we have a preference towards providing more regulatory certainty and for reviewing the benefits and limitations of different estimation methods in consultation with a broad range of relevant stakeholders before changing approaches.

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626 NER, cl 6.4.1(b). NER. cl 6A.5.1(b) is similar, but specifies 'transmission consultation procedures'.

627 AER, *Draft Rate of Return Guideline, Explanatory Statement*, August 2013, p.152.

628 JEN, *Revocation and substitution submission Attachment 6-1 Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 109.

629 CEG, *Measuring expected inflation for the PTRM*, June 2015, pp. 3, 6; CEG, *Measuring expected inflation for the PTRM: A report for AGN*, January 2016, p. 8.

A Our foundation model approach

We determined the allowed return on equity by applying our foundation model approach. The foundation model approach was developed after extensive consultation during the formation of our Rate of Return Guideline in December 2013.

Service providers submitted that our approach prevents us from having appropriate regard to relevant material.[631] We disagree, and provide the following for clarification:

- The foundation model approach identifies one model as the foundation model, but this is just a starting point and does not prevent other models, or combinations of multiple models, from being adopted. As set out in the Guideline:[632]

> The use of regulatory judgement may also result in a final estimate of the return on equity that is outside the foundation model range. This recognises that, ultimately, our rate of return must meet the allowed rate of return objective. In these circumstances, we may reconsider the foundation model input parameter estimates, or more fundamentally, we may also reconsider the foundation model itself.

- The foundation model approach has six steps, but this does not mean that material considered in earlier steps are given more weight than material considered in later steps.
- Identifying material as being valuable in the estimation of one parameter (eg. market risk premium) does not prevent us from considering the value of that parameter for the estimation of other parameters (eg. overall return on equity). However, in using certain material to inform the estimation of multiple parameters, it is important to consider that the weight being afforded to the material reflects the relative merits of the material and is not in effect being 'double-counted'.
- We do not consider that having regard to relevant material requires running all the equity models put before us. Rather, the need to run these models depends on how valuable we consider they are in estimating a return on equity commensurate with the efficient financing costs given the systematic risk associated with JEN's regulated services.

Our approach was endorsed by the Tribunal, which stated recently:

> 649 The AER has appropriately extracted from the 2012 Rule Amendments the following propositions summarising how [the AEMC] intended the 2012 Rule

[631] Citipower, Revised Regulatory Proposal 2016–2020, January 2016, pp. 296–297; Powercor, Revised Regulatory Proposal 2016–2020, January 2016, pp. 291–292, JEN, Revised regulatory proposal - attachment 6.1, January 2016, pp.45, 49–50 ; NERA, *The cost of equity: response to the AER's final decisions for the NSW and ACT Electricity Distributors, and for Jemena Gas Networks*, June 2015; Frontier Economics, *Key issues in estimating the return on equity for the benchmark efficient entity*, June 2015, p. 7 & 25.

[632] AER, Rate of Return Guideline: Explanatory Statement, December 2013, p. 62.

Amendments, in particular r 6.5.2 of the NER and r 87(2) of the NGR, to operate:

(a) the RoR Objective has primacy in any estimation of the rate of return on equity (pp 18, 36 and 38-39);

(b) the AER's obligation to "have regard to" the material referred to in NER 6.5.2(e) when determining the allowed rate of return is subject to its obligation under NER 6.5.2(b) to determine the allowed rate of return such that it achieves the RoR Objective (and equally under NGR r 87(3) and 87(2)) (pp 36-37);

(c) the AER must actively turn its mind to the factors listed, but it is up to the regulator to determine whether and, if so, how the factors should influence its decision (if at all) (pp 36-37);

(d) it is important that the AER be given flexibility to adopt an approach to determining the rate of return that is appropriate to market conditions (p 44);

(e) it is important for the AER to be transparent in its approach to determining the rate of return in order to maintain the confidence of service providers, investors and consumers in the process (pp 23 and 24);

(f) it is important that all stakeholders (including consumers) have the opportunity to contribute to the development of the RoR 2013 Guideline and its evolution through periodic review every three years (pp 45-46);

(g) the RoR 2013 Guideline should include details as to the financial models that the AER would take into account in making a determination, and why it has chosen those models over other models (p 70);

(h) the RoR 2013 Guideline should provide a service provider with a reasonably predictable, transparent guide as to how the AER will assess the various estimation methods, financial models, market data and other evidence in meeting the overall RoR objective. The Guideline should allow a service provider to make a reasonably good estimate of the rate of return that would be determined by the AER if the Guidelines were applied (p 71); and

(i) while the RoR 2013 Guideline are not determinative, these should "provide a meaningful signal as to the regulator's intended methodologies for estimating return on equity" and be capable of being given "some weight" to narrow the debate about preferred methodologies and models. They should be used as a starting point in making a regulatory determination (p 71).

Ultimately, as the Tribunal has emphasised, we must exercise our regulatory judgement about the weight that should be attached to different models, data, methods and other evidence that may be available to us when making our decision.[633] We recognise that there are potential weaknesses in the different models and estimation methods. Nevertheless, we are charged with deciding from the available evidence, a

[633] [2016] ACT 1 at 180-222

return on equity that we consider contributes to the rate of return objective. The Australian Competition Tribunal has described the way in which the AER should carry out this task as follows:[634]

> 713 …The Tribunal takes the obligation on the AER so expressed as requiring it to give consideration to the range of sources of evidence and analysis to estimate the rate of return. It need not give particular weight to any one source of evidence, and indeed it might treat particular evidence as having little or no weight in the circumstances. It is for the AER to make that assessment. It may also have regard to other factors. ….
>
> 714 The AER accepted that it did not itself "run" other models than the SL CAPM. It had presented to it the outcome of other models, through various expert reports provided to it. It considered, but did not adopt, those outcomes. It is said by the Network Applicants that the AER's approach was based upon an incorrect step – both non-compliant with the Rules and in fact – that the SL CAPM was a superior model and so an appropriate "foundation model" for the purposes of the RoR 2013 Guideline.
>
> 715 The relevant textual features, in the view of the Tribunal, are the breadth and generality of the words "relevant estimation methods, financial models, market data and other evidence". They do not suggest a prescriptive obligation to consider particular methods, models or data. If that were intended, one would expect it to be more prescribed. Rather, it is left to the AER to decide what is "relevant" and a dispute about relevance is not itself a basis for asserting error of the character now asserted. In fact, the AER did have regard – in the sense of considering – the material put forward by the Network Applicants. The same reasoning suggests that the obligation to "have regard to" certain material is to consider it and to give it such weight as the AER decides. Again, if a more sophisticated obligation were intended, it is likely it would have been differently expressed. …

This means that when we consider conflicting evidence, we must come to a conclusion that we consider fits the regulatory requirements. This has been recently emphasised again by the Tribunal:[635]

> 802 … The mere existence of competing views or of reasons why a particular piece of information might point in one or other direction will not of itself mean that the Tribunal should or will reach a view different from that of the AER. That is particularly so where there are competing expert opinions. In the universe of the NEL and the NGL (as in other areas of decision making) it is a feature of the qualitative decision making process that competing materials, including competing expert opinions, may be available to the AER. It must make its decisions under, and in accordance with, the legislative and regulatory instruments having regard to that material. …

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634 [2016] ACT 1 at pp.200-201

635 [2016] ACT 1 at 219-221

B Equity models

As part of the rate of return guideline (the Guideline) process, we focused on four key models that may be used to estimate the return on equity, or to inform the implementation of our foundation model approach:

1. The Sharpe–Lintner Capital Asset Pricing Model (Sharpe-Lintner CAPM)
2. The Black Capital Asset Pricing model (Black CAPM)
3. The Fama French Three Factor Model
4. The Dividend Growth Model

We have considered all models that have been proposed. In this sense, all of the models are relevant. In addition to these models, we have considered information submitted in relation to non-standard versions of the Sharpe-Lintner CAPM — the Wright and historical specifications.

Service providers proposed using empirical estimates from the Black CAPM, Fama-French model, and dividend growth model. They proposed to use the estimates from these models to inform the overall return on equity through either:[636]

- estimating their proposed return on equity as part of a multi-model approach, or to inform input parameters into the Sharpe-Lintner CAPM, and/or
- providing evidentiary support that their estimate of the return on equity is reasonable and will contribute to the achievement of the allowed rate of return objective.

While we have considered all proposed models, we are not persuaded that they are all of equal value. This appendix sets out our assessment of the relative merits of the

[636] ActewAGL, *Access Arrangement Information for the 2016-21 ACT, Queanbeyan and Palerang Access Arrangement, Appendix 8.02: Return on equity-detailed proposal*, June 2015, p. 45–50; APTNT, *Amadeus Gas Pipeline: Access Arrangement Revision Proposal*, August 2015, p. 136–138; AGN, *2016/17 to 2020/21 Access Arrangement Information, Attachment 10.1: Rate of Return*, July 2015, p. 43–44; AusNet Services, *Regulatory proposal 2016-20*, 30 April 2015, p. 331–333; United Energy, *2016 to 2020 Regulatory Proposal,* April 2015, pp. 117–120; CitiPower, *Regulatory proposal 2016-2020*, April 2015, p. 221–224; Powercor, *Regulatory proposal 2016-2020*, April 2015, p. 229–232; Jemena Electricity Networks (Vic) Ltd, *2016-20 Electricity Distribution Price Review Regulatory Proposal, Attachment 9-2, Rate of return proposal,* April 2015, pp. 81–85; CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 267, 281–326; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 261, 275–320; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 53–54, 104–105; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp.37–40, 52–78; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 44–82 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 42–83; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 38–77; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 75–77.

models for estimating the return on equity, either directly through a foundation model or multi-model approach, or through informing other parameters of the return on equity.

B.1 Sharpe-Lintner CAPM

The Sharpe-Lintner CAPM is an equilibrium asset pricing model. It is based on the well accepted finance principle that rational investors will seek to minimise risk (as measured by portfolio variance) for a given expected return.[637]

We consider the Sharpe-Lintner CAPM will, as the foundation model in our foundation model approach and with reasonably selected input parameters, result in a return on equity commensurate with the benchmark entity's efficient financing costs. We consider our cross checks[638] on the return on equity provide supporting evidence that the return on equity derived using the Sharpe-Lintner CAPM-based foundation model approach will contribute to the achievement of the allowed rate of return objective.

We consider this is the case for the reasons set out in this decision and in the Guideline's explanatory statement and its appendices.[639] In coming to this conclusion, we and our consultants have considered the material submitted to us after publishing the Guideline. This has included consideration of proposals from service providers' and submissions on these proposals.[640]

The Sharpe-Lintner CAPM is the dominant model used to estimate firms' cost of capital by providers of capital to firms (that is, investors).[641] We consider the model:

- is reflective of economic and finance principles and market information
- is fit for purpose as it was developed for estimating the cost of capital
- can be implemented in accordance with good practice
- is not unduly sensitive to errors in inputs or arbitrary filtering
- uses input data that is credible and verifiable, comparable and timely and clearly sourced
- is sufficiently flexible to allow for changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.

While a range of challenges to the Sharpe-Lintner CAPM have been raised over many years, the model remains the dominant asset pricing model used for capital

637 Many university texts cover the model. See for example: Peirson, Brown, Easton, Howard and Pinder, *Business Finance*, McGraw-Hill, Ninth edition, 2006, pp. 200–207.

638 See the 'Overall return on equity' subsection in section 3.4.1.

639 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 10–14.

640 We are concurrently assessing regulatory proposals from three different service providers. We are also assessing revised regulatory proposals from eight different service providers. We take these businesses' different adaptations into account.

641 See Brealey, Myers, Partington and Robinson, *Principles of corporate finance*, McGraw Hill Australia, 2007, p. 216.

budgeting.[642] The model—estimated as the sum of the risk free rate and the product of the equity beta and market risk premium—is relatively simple to implement. We consider these input parameter estimates are based on robust, transparent and replicable analysis. We consider its use in this context will lead to a predictable estimate of the return on equity, and this will be valuable in ensuring regulated service providers can efficiently raise equity.

In relation to the Sharpe-Lintner CAPM, McKenzie and Partington found the following:[643]

- As the foundation model it, 'provides a starting point, which is firmly based in a mature and well accepted theoretical and empirical literature'.
- Its efficacy comes from surviving the test of time. They noted the 'model has been around for in excess of half a century and has become the standard workhorse model of modern finance both in theory and practice'.
- Its 'place as the foundation model is justifiable in terms of its simple theoretical underpinnings and relative ease of application'.
- The majority of international regulators primarily base their decision on the Sharpe-Lintner CAPM framework.

Further, McKenzie and Partington have expressed that the foundation model approach, using the Sharpe-Lintner CAPM as the foundation model, would be expected to:[644]

- lead to a reasonable estimate of the return on equity
- lead to a rate of return that meets the allowed rate of return objective
- not lead to a downward biased estimate of the cost of equity for a benchmark efficient entity.

In relation to the Sharpe-Lintner CAPM, Partington and Satchell noted:[645]

- The model is 'ubiquitous in relation to the estimation of the cost of equity' and 'the same cannot be said for the alternative models proposed by the regulated businesses.[646]

[642] McKenzie and Partington note, 'no framework is perfect, the foundation model has its weaknesses, but these are well-documented and in many cases can either be diagnosed or perhaps compensated for in empirical practice…This model has been around for in excess of half a century and has become the standard workhorse model of modern finance both in theory and practice. See *Report to the AER part A: Return on equity*, October 2014 p. 9.

[643] McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 9–10.

[644] McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 13–14.

[645] Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, p. 17–21.

[646] We acknowledge the study by Stephan Schaeffler and Christoph Weber that examined the use of other models in regulatory practices in 21 countries [Stephan Schaeffler and Christoph Weber, 'The Cost of Equity of Network Operators – Empirical Evidence and Regulatory Practice', *Competition and Regulation in Network Industries*, 14(4), 2013, p. 386]. The same study also concluded that the, 'standard model for determining capital costs' for

- It is 'widely used and understood'.
- The model has passed the test of time and 'has had several decades of widespread practical use in estimating the cost of capital'.

Handley indicated that our use of the Sharpe-Lintner CAPM as foundation model was entirely appropriate and reasonable.[647] He noted: [648]

> '[t]he Sharpe-CAPM is the standard (equilibrium) asset pricing model. It has a long established and well understood theoretical foundation and is a transparent representation of one of the most fundamental paradigms of finance – the risk-return trade off.

A substantial amount of the material submitted to us after publishing the Guideline commented on our conclusions and choice of Sharpe-Lintner CAPM as the foundation model. The majority of stakeholders other than service providers supported the use of the model as the foundation model.[649] These submissions are detailed in section B.1.1.

Generally, service providers submitted that the allowed return on equity for a benchmark efficient entity from the foundation model approach (using the Sharpe-Lintner CAPM as the foundation model) is likely to be downward biased. In their proposals, these service providers submitted that we should use different models and additional information to the information in the foundation model approach.[650] Service

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energy businesses is the SLCAPM. We also note the prevalence of the Sharpe-Lintner CAPM in recent valuation reports. In all the reports we examined, only one did not use the model. All other reports used the model as the initial or primary estimation method. Only five of the reports examined utilised an alternative estimation model (the dividend growth model), and four of these five reports used the alternative model as a cross-check on the primary estimate from the Sharpe-Lintner CAPM. Ten reports noted the theory size premiums associated with the Fama-French three-factor model, but none took the further step to estimate the Fama-French model. No reports discussed the Black CAPM. We consider that the current evidence from independent valuation reports supports our view that the Sharpe-Lintner CAPM is the clearly superior model to use as the foundation model.

647 Handley, *Advice on return on equity,* 16 October 2014, p. 4.

648 Handley, *Advice on return on equity,* 16 October 2014, p. 4.

649 For example, Mr Bruce Mountain, *CCP2, Advice on AER preliminary decisions and revised proposals from Energex, Ergon Energy and SA Power Networks*, July 2015, p.11; Consumer Utilities Advocacy Centre, Re: Victorian electricity distribution pricing review (EDPR), 2016 to 2020, 13 July 2015, p. 2; Victorian Energy Consumer and User Alliance, Submission to the AER, Victorian Distribution Networks' 2016-20 Revenue Proposals, July 2015, p. 3; Business SA, *Submission to AER on their preliminary decision, 3 July 2015*, p.2; Alternative Technology Association, ActewAGL Access Arrangement Proposal, 10 August 2015, p. 10; Energy Retailers Association of Australia, *Preliminary Decisions for Ergon Energy and Energex determinations 2015-16 to 2019-20*, 3 July 2015, p.1; Energy Consumers Coalition of South Australia, *AER SA Electricity Distribution Revenue Reset, The AER preliminary decision - A response*, 3 July 2015, p.38.

650 ActewAGL, *Access Arrangement Information for the 2016-21 ACT, Queanbeyan and Palerang Access Arrangement, Appendix 8.02: Return on equity-detailed proposal, Submission to the Australian Energy Regulator*, June 2015, p. 1; APTNT, *Amadeus Gas Pipeline: Access Arrangement Revision Proposal*, August 2015, p. 137; AGN, *2016/17 to 2020/21 Access Arrangement Information, Attachment 10.1: Rate of Return*, July 2015, p. 8; AusNet Services, *Regulatory proposal 2016-20*, 30 April 2015, p. 331; United Energy, *2016 to 2020 Regulatory Proposal,* April 2015, p. 121; CitiPower, *Regulatory proposal 2016-2020*, April 2015, p. 223; Powercor, *Regulatory proposal 2016-2020*, April 2015, p. 231; Jemena Electricity Networks (Vic) Ltd, *2016-20 Electricity Distribution Price Review Regulatory Proposal, Attachment 9-2, Rate of return proposal,* April 2015, p. 84.

providers also resubmitted these positions in their submissions on other service providers' regulatory proposals.[651]

Service providers appear to have submitted that the downward bias is (in part) due to improper consideration of the Black CAPM, Fama-French model, and dividend growth model. Service providers appear to have submitted that these other models should be used to either directly estimate the return on equity[652] or used to inform appropriate parameter values to use in applying the Sharpe-Lintner CAPM. [653] A number of service providers appear to have submitted, directly or implicitly, that the parameters we select for the Sharpe-Lintner CAPM under the foundation model approach are insufficient to overcome the downward bias in the Sharpe-Lintner CAPM.[654]

CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 267, 286–326; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 261, 280–320; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 53–54, 56–105; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 37–38, 40–78; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 44–82 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 42–83; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 38–77; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 65–73;

651 AGN, AusNet Services, CitiPower/Powercor, and United Energy each put forward a submission titled, *Submission in relation to the first round of regulatory determination under the new rules* in 13 February 2015; Several service providers also submitted NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015; Additionally, CitiPower/Powercor, Jemena Electricity Networks, United Energy, each put forward a submission titled *Submission in relation to the current regulatory determination processes for SAPN, Energex, Ergon Energy, AGN in July 2015.*

652 ActewAGL, Jemena Electricity Networks, AusNet Services, CitiPower/Powercor, APTNT, Australian Gas Networks (AGN) and United Energy.

653 Jemena Electricity Networks, AusNet Services, CitiPower/Powercor, APTNT, ActewAGL, Australian Gas Networks (AGN) and United Energy; CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 267, 286–326; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 261, 280–320; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 53–54, 56–105; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 37–78; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 44–82 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 42–75; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 38–77; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 68–77.

654 ActewAGL, *Access Arrangement Information for the 2016-21 ACT, Queanbeyan and Palerang Access Arrangement, Appendix 8.02: Return on equity-detailed proposal, Submission to the Australian Energy Regulator*, June 2015, p. 2; AusNet Services, *Regulatory proposal 2016-20*, 30 April 2015, p. 311; United Energy, *2016 to 2020 Regulatory Proposal,* April 2015, p. 113; CitiPower, *Regulatory proposal 2016-2020*, April 2015, p. 210; Powercor, *Regulatory proposal 2016-2020*, April 2015, p. 218; Jemena Electricity Networks (Vic) Ltd, *2016-20 Electricity Distribution Price Review Regulatory Proposal, Attachment 9-2, Rate of return proposal,* April 2015, p. 4;; CitiPower*, Revised regulatory proposal 2016–2020*, January 2016, pp. 286–292; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 280–286; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*,

The key information that service providers used to support these propositions included:

- Studies of ex post performance of the Sharpe-Lintner CAPM.[655] Frontier and NERA submitted that empirical tests reject the model and that it performs poorly relative to the other models.[656]
- Other direct estimates of the return on equity from the Black CAPM, Fama-French model, and dividend growth model.[657] Service providers submitted:
    - the Black CAPM as evidence that the Sharpe-Lintner CAPM displays low beta bias
    - the Fama-French model as evidence that the Sharpe-Lintner CAPM displays book-to-market bias
    - the dividend growth model as evidence that the Sharpe-Lintner CAPM, as applied by the AER, is not reflective of prevailing market conditions.

These submissions from service providers are detailed further in sections B.1.3 and B.1.2 below.

The key submissions on these points were considered in our preliminary decision for JEN, and this material remains relevant. We have reviewed the new material before us. While we recognise all models have strengths and weaknesses, we consider the Sharpe-Lintner CAPM to be the superior model before us for the purpose of estimating the allowed return on equity. We do not consider that service providers' submissions support any further adjustment to our Sharpe-Lintner CAPM input parameters. We are satisfied that we have had significant regard to prevailing market conditions in estimating the return on equity for a benchmark efficient entity.[658] We are satisfied that our return on equity estimate would fairly compensate a benchmark entity facing a similar degree of risk to JEN for its efficient equity financing costs.

January 2016, pp. 57–64; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 45–46, 69–70; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 50–52 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 49–51; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 44–47; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 68–73, 74–75; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, p. 130.

655 For instance, several service providers submitted the consultant report, NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015;.

656 Frontier Economics, *Key issues in estimating the return on equity for the benchmark efficient entity*, June 2015, pp. 7–10; NERA, *The Cost of Equity: Response to the AER's Final Decisions for the NSW and ACT Electricity Distributors, and for Jemena Gas Networks*, June 2015, p. ii.

657 For instance, the majority of service providers submitted that the return on equity estimated using the FFM, Black CAPM and DGM was higher than under the SLCAPM. For recent reports, see Frontier, *An updated estimate of the required return on equity*, June 2015.

658 NER clauses 6A.6.2 (g) and 6.5.2(g) and NGR rule 87 (7).

Services providers submitted that the AER has "erred in finding that the SL-CAPM is the clearly superior model",[659] submitting that no evidence (such as expert reports) is cited in support of this statement. We note that the Tribunal recently found no error in our approach to estimating the return on equity, including the use of the Sharpe-Lintner CAPM in our foundation model approach.[660]

B.1.1 Submissions supporting the use of the Sharpe-Lintner CAPM as the foundation model

The majority of stakeholders (other than service providers) supported using the Sharpe-Lintner CAPM as the foundation model.[661] However, a number of them submitted we should consider lowering our input parameters used in the model relative

659 CitiPower, *Revised Regulatory proposal 2016–2020*, January 2016, p. 286–289; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, p. 280–283; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 57–60; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 41–43; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 47–49 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp 46–48; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 68–77.

660 For example, see: Australian Competition Tribunal, Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1, 26 February 2016, paragraphs 713–717, 735, 757; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 68–73.

661 For example, Mr Bruce Mountain, *CCP2, Advice on AER preliminary decisions and revised proposals from Energex, Ergon Energy and SA Power Networks*, July 2015, p.11; Consumer Utilities Advocacy Centre, Re: Victorian electricity distribution pricing review (EDPR), 2016 to 2020, 13 July 2015, p. 2; Victorian Energy Consumer and User Alliance, Submission to the AER, Victorian Distribution Networks' 2016-20 Revenue Proposals, July 2015, p. 3; Business SA, *Submission to AER on their preliminary decision, 3 July 2015*, p.2; Alternative Technology Association, ActewAGL Access Arrangement Proposal, 10 August 2015, p. 10; Energy Retailers Association of Australia, *Preliminary Decisions for Ergon Energy and Energex determinations 2015-16 to 2019-20*, 3 July 2015, p.1; Energy Consumers Coalition of South Australia, *AER SA Electricity Distribution Revenue Reset, The AER preliminary decision - A response*, 3 July 2015, p.38; Origin Energy, *Submission on ActewAGL's revised access arrangement for 2016–21*, 4 February 2016, p. 3; Origin Energy, *Submission on AGN's revised access arrangement for 2016–21*, February 2016; Origin Energy, *Submission on the AER's preliminary decisions on the Victorian distribution network service providers for 2016–20*, 6 January 2016, p. 3; Origin Energy, *Submission on the Victorian networks' revised proposals (for 2016–21*), 4 February 2016; AGL, *Submission on the AER's draft decision on AGN's 2016–21 access arrangement*, 4 February 2016, p. 2; Victorian Government, S*ubmission on the Victorian electricity distribution network service providers' revised regulatory proposals for 2016–20*, 12 February 2016, p. 1–2; CCP (panel 5), *Transmission for the generations: Response to proposal by AusNet Services transmission group pty ltd and AER issues paper for AusNet Services transmission revenue review 2017–22*, February 2016, p. 41; CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 25 February 2016, p. 30; EUCV*, A response to AusNet revenue reset proposal for the 2017–2022 period*, 9 February 2016, p. 40; CCP (panel 8), *Advice to AER from Consumer Challenge Panel sub-panel 8 regarding the AER Daft Decision and Australian Gas Networks' (SA) revised access arrangement 2016–2021 proposal*, 32 March 2016, p. 2.

to those published with the Guideline.[662] Table 3-26 summarises a number of these submissions.

Table 3-26 Submissions supporting the SLCAPM

Stakeholder	Submission
AGL	AGL fully supported our use of the Guideline for determining a rate of return which balances the interests of the distributions networks and energy consumers. AGL submitted that the equity beta provided by the Guideline can be considered generous given the regulated framework ensures revenue recovery by distribution networks.[663]
Alternative Technologies Association (ATA)	ATA expected our determinations to be consistent with our recent decisions and provide for a lower rate of return.[664]
Business South Australia	Business SA supported our decision not to depart from its rate of return guideline.[665]
The Consumer Utilities Advocacy Centre (CUAC)	The Consumer Utilities Advocacy Centre submitted that the weighted average cost of capital proposals from distributors are excessive, and encourages us to instead apply the methodology of the Guideline in estimating a fair rate of return.[666]
Consumer Challenge Panel (CCP)	The CCP was unconvinced by arguments from the service providers' various consultants' reports urging us to use models other than the Sharpe-Lintner CAPM for calculating the rate of return. The CCP considered that these alternative models are currently not being utilized by academics nor valuation practitioners.[667]

662 For example, Alliance of Electricity Consumers, *Submission to the AER's Preliminary Decision Queensland*, 3 July 2015; Alliance of Energy Consumers, *Submission to Energex and Ergon Energy's Revised Regulatory Proposals (Qld)*, 24 July 2015, p.9; QCOSS, *Response to Australian Energy Regulator Preliminary Decision for Queensland distributors 2015-2020*, 3 July 2015, p.20; Total Environment Centre, *Submission to the AER on the Preliminary Decisions on the QLD distributors' Regulatory Proposals 2015-20,* 3 July 2015, p.8; Cotton Australia, *AER Determination Ergon Energy*, 3 July 2015, p.2; Energy Users Association of Australia, *Submission to AER draft determination and Energex's revised revenue proposal 2015 to 2020*, 24 July 2015, p.11; Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016-20 Revenue Proposals*, 13 July 2015, p.11; QCOSS, *Response to Australian Energy Regulator Preliminary Decision for Queensland distributors 2015-2020*, 3 July 2015, p.21; Energy Users Association of Australia, *Submission to AER draft determination and Energex's revised revenue proposal 2015 to 2020*, 24 July 2015, p.11; Canegrowers, *AER Draft Determination: Ergon Energy and Energex - Network Distribution Resets 2015-2020, 3 July 2015*, p.2; ECCSA, *A response to the AER draft decision on AGN's AA2016 revenue reset,* February 2016, p. 32–37; VECUA, *Submission on the AER: AER preliminary 2016–20 revenue determinations for the Victorian DNSPs*, 6 January 2016, p. 2; CCP (panel 5), *Transmission for the generations: Response to proposal by AusNet Services transmission group pty ltd and AER issues paper for AusNet Services transmission revenue review 2017–22*, February 2016, p. 41; CCP (panel 3), *Submission to the Australian Energy Regulator (AER): An overview Response to AER Preliminary Decisions and revised proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, 25 February 2016, pp. 10, 30–31, 33.

663 AGL, *Re: Australian Gas Networks (South Australia): Access Arrangement Proposal 2016-21*, 10 August 2015, p. 2.

664 Alternative Technology Association, *Submission on Australian Gas Networks (SA) Access Arrangement Proposal*, 10 August 2015, p.10.

665 Business SA, *Submission to AER on their preliminary decision, 3 July 2015*, p.2.

666 Consumer Utilities Advocacy Centre, *RE Victorian electricity distribution pricing review (EDPR), 2016 to 2020*, 13 July 2015, p.2.

667 Mr Bruce Mountain, *CCP2, Advice on AER preliminary decisions and revised proposals from Energex, Ergon Energy and SA Power Networks*, July 2015, p.11.

Stakeholder	Submission
Energy Consumers Coalition of SA (ECCSA)	The Energy Consumers Coalition of SA (ECCSA) rejected SA Power Networks' assertion that its risk profile has changed and that our approach to return on equity developed during the Better Regulation program does not reflect this change in risk. The ECCSA notes that the Better Regulation program was finalised within the past 2 years and considers it to be contemporary.[668] The ECCSA is concerned with AGN's equity modelling framework, which the ECCSA consider to be arbitrary and includes weighting for models that have not met the tests of transparency, repeatability and validity in the Australian context. The ECCSA rejected the suggestion that a lower cost of equity (as would be derived under the Guideline) would result in an inability of AGN to invest in the network in the future as it could not recover its costs. If AGN applies prudent capital management principles, there is no reason to believe that it would not recover its costs, although it may not achieve the same above normal profits as it currently enjoys.[669]
The Energy Retailers Association of Australia (ERAA)	ERAA supported our proposed methodology and determination in relation to the rate of return. It believed our preliminary decision on the rate of return better reflects the financing costs of SA Power Networks with respect to the level and exposure to risk that applies to an Australian regulated energy network service provider and should be preferred over SA Power Networks' estimate.[670]
The Energy Users Association of Australia (EUAA)	The Energy Users Association of Australia (EUAA) considered that the service providers were over compensated by the AER for post GFC financial market conditions that did not eventuate. The EUAA proposed a market risk premium of 5.00 per cent and an equity beta of 0.4, resulting in a rate of return of 5.07 per cent.[671]
Origin Energy	Origin Energy submitted that the AER has no reason to expect that departing from relying principally on the output of the Sharpe-Lintner CAPM would better contribute to the achievement of the allowed rate of return objective.[672] Origin Energy maintained its view that we have adopted a balanced and pragmatic approach that provides certain and predictable outcomes for investors and provides a balance between the views of consumer groups and the network businesses.[673] Origin Energy submitted that the Guideline provides transparency and predictability of outcomes in rate of return issues and a balance between the views of distributors and consumers, and considers that departures from the Guideline should only be approved where there is strong evidence to support the departure.[674]
Queensland Council of Social Service (QCOSS)	The Queensland Council of Social Service considered the rate of return parameters in the preliminary decision are too conservative and are not consistent with both the low prevailing cost of capital and the low risk of distribution activities.[675] The Queensland Council of Social Service submitted that empirical studies, as well as the

668 Energy Consumers Coalition of South Australia, *Submission on SA Power Networks' revised proposal, 24 July 2015*, p.6.

669 ECCSA, *Submission on Australian Gas Networks' Access Arrangement Proposal 2016-2021*, 16 August 2015, p.66.

670 Energy Retailers Association of Australia, *Preliminary Decision SA Power Networks determination 2015-16 to 2019-20*, 3 July 2015.

671 Energy Users Association of Australia, *Submission to AER draft determination and Energex's revised revenue proposal 2015 to 2020*, 24 July 2015, p.11.

672 Origin Energy, *Re Submission to Victorian Electricity Distributors Regulatory Proposals*, 13 July 2015, p.10.

673 Origin Energy, *Submission to AER preliminary decision SA Power Networks*, 3 July 2015.

674 Origin Energy, *Submission on Australian Gas Networks Distribution 2016-21 Access Arrangement Proposal for ACT*, 10 August 2015, p.5.

675 QCOSS, *Response to Australian Energy Regulator Preliminary Decision for Queensland distributors 2015-2020*, 3 July 2015, p.20.

Stakeholder	Submission
	reports from McKenzie and Partington and Frontier suggest an appropriate equity beta to be around 0.5.[676]
Victorian Energy Consumer and User Alliance (VECUSA)	The Victorian Energy Consumer and User Alliance considered the Victorian service providers' proposed rate of return allowances of 7.18-7.38 per cent to be excessive and based on major unjustified departures from the Guideline.[677] The Victorian Energy Consumer and User Alliance considered that our approach to estimating return on equity is more appropriate than the distributors' proposed approaches that adopt weighted averages of different return on equity models. These proposed departures have not been subjected to any rigorous analysis or stakeholder consultation.[678] The Victorian Energy Consumers and Users Alliance noted Professor Henry's report[679] suggests an equity beta at the low end of the Guideline range (i.e. 0.4) more accurately reflects the empirical data available.[680] The Victorian Energy Consumer and User Alliance (VECUA) agreed with other submissions we received over the past year that regarding the regulatory framework for Australia's monopoly networks as providing an extremely low business risk environment. The VECUA submits that the market risk premium should be set at the bottom of the Guideline range (i.e. 5.0%).[681]

Source: AER analysis of submissions.

We consider the submissions in Table 3-26 generally support our use of the Sharpe-Lintner CAPM as the foundation model in our foundation model approach. However, we do not agree with submissions to lower the input parameters from those published in the Guideline. Our reasons for this position are set out in section 3.4.1.

B.1.2 Empirical tests of the Sharpe-Lintner CAPM

Service providers submitted that empirical tests indicate that the Sharpe-Lintner CAPM performs poorly compared to the Fama-French model and Black CAPM.[682]

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676 QCOSS, *Response to Australian Energy Regulator Preliminary Decision for Queensland distributors 2015-2020*, 3 July 2015, p.21.

677 Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016-20 Revenue Proposals*, 13 July 2015, p.3.

678 Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016-20 Revenue Proposals*, 13 July 2015, p.10.

679 Henry 0.T., *Estimating Beta: An Update*, April 2014.

680 Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016-20 Revenue Proposals*, 13 July 2015, p.11.

681 Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016-20 Revenue Proposals*, 13 July 2015, p.11.

682 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 281–289; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 275–283; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 57–72; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp.41–45; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 46–49 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 46–49; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return &*

At this time, we conclude that the evidence is unclear given the empirical limitation of the tests. Given the available evidence and the limitations of this evidence, we consider that there is no strong basis to conclude that the Black CAPM and/or Fama-French model provide materially better estimates of expected return on equity. Notwithstanding potential limitations with the empirical tests, we consider that our implementation of the Sharpe-Lintner CAPM in our foundation model approach recognises any potential empirical limitations.

On the empirical performance of the Sharpe-Lintner CAPM, McKenzie and Partington found the following:[683]

- The fact some work appears to show other models better explain the cross section of realised average returns does not invalidate the use of the model for several reasons. For instance, the cross section of returns is only one dimension of interest.[684]
- The evidence against the Sharpe-Lintner CAPM may not be as robust as once thought when more appropriate statistical tests are used.
- The empirical evidence against the model does not invalidate its use for estimating the cost of capital for projects when making capital budgeting decisions.

Partington and Satchell made the following observations for testing empirical performances of asset pricing models:

- Testing of an asset pricing model involves how well it describes ex-ante expected returns when security prices are in equilibrium. Empirical work attempts to examine how well the asset pricing model explains ex-post realised returns which 'may not be a particularly good test'.[685]
- The results are dependent on the method used to conduct the test (for example the characteristics used in sorting stocks into portfolios when testing model performance), was also noted by Kan, Robotti and Shanken. [686]
- Fischer Black has previously suggested that testing of model performance using ex-post realised returns 'might be telling…more about the shocks to the expected returns (volatility) rather than the equilibrium expected returns'.[687]
- NERA referred to the work of Kan, Robotti and Shanken for the superior performance of the Fama-French model compared to the Sharpe-Lintner CAPM.[688]

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gamma, 6 January 2016, pp. 41–49; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 68–73; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, p. 110–130.

683 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 9–10.

684 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 9.

685 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, p. 20.

686 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, pp. 23–24.

687 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, p. 20.

688 NERA, *The Cost of Equity: Response to the AER's final decisions for the NSW and ACT Electricity Distributors, and for Jemena Gas Networks*, June 2015, p. 33 & 37

> Partington and Satchell stated that they "are not persuaded at this time as there is no conclusive evidence of the superior performance of the FFM–as Kan, Robotti and Shanken also found the conditional CAPM and ICAPM to be the best performing models if the portfolios are formed by ranking stocks on size and CAPM beta instead of by book-to-market and size".[689] Partington and Satchell noted that Lewellen, Nagel and Shanken have cautioned that 'none of the models provides much improvement over the simple or consumption CAPM when performance is measured by the GLS[690] R2 or q'.[691]

In response to our preliminary decision, HoustonKemp submitted that Kan, Robotti and Shanken do not say that when portfolios are formed by size and beta that the CAPM can be shown to be superior to the Fama-French three-factor model.[692] In response, Partington and Satchell state that:[693]

> We stand by our observations that in Kan, Robotti and Shanken (2013) the results of the asset pricing tests in general, and tests of the FF3 model in particular, depend upon the characteristics used in sorting stocks into portfolios…in Kan, Robotti and Shanken (2013) using tests based on size and book to market sorts for portfolios the FF3 model ranks second to the ICAPM, but when portfolios are sorted on size and beta the performance of FF3 degrades

Several service providers resubmitted an empirical test of the Sharpe-Lintner CAPM and the Black CAPM by NERA that was considered in the JGN final decision.[694] We continue to observe that the results in NERA's report appear counterintuitive. For instance, NERA's in-sample tests indicated there was a negative relation between returns and beta—which is not consistent with the theory underpinning the Sharpe-Lintner CAPM or the Black CAPM.[695] NERA also provided an estimate of the zero-beta premium of 10.75 per cent.[696] It has been acknowledged that it is implausible for the zero beta premium to be equal to or greater than the market risk premium.[697] Further, having reviewed this report in relation to its results on the Black CAPM, Partington advised:[698]

> the results of NERA's various empirical analyses (most recently NERA, 2015) show that the reference portfolio they use is not on the efficient set ex-post. If it were, then there would be a perfect linear relation between the returns on

689 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, p. 24.

690 Generalised least squares,

691 Partington and Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, p. 21.

692 HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 27.

693 Partington and Satchell, draft report, April 2015, pp. 46–47.

694 NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015.

695 NERA, *Empirical performance of the Sharpe–Lintner and Black CAPMs*, February 2015, pp. 25, 31.

696 NERA, *Empirical performance of the Sharpe–Lintner and Black CAPMs*, February 2015, p. 29.

697 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 92; SFG, *Cost of Equity in the Black Capital Asset Pricing Model*, 22 May 2014, p. 3.

698 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 25.

> securities and their betas calculated relative to the reference portfolio. Empirically, however, this is not the case. Therefore, the reference portfolio is not on the efficient set.
>
> The implication of a reference portfolio that is not on the efficient set is that there is an infinite set of zero beta portfolios with differing returns that can be associated with the reference portfolio. In this case, the zero beta return can be more or less arbitrarily chosen. NERA (2015) and SFG (2015) restrict the choice by fitting a regression model to the data in order to obtain a single estimate.

McKenzie and Partington considered that the empirical results for the Black CAPM and Sharpe-Lintner CAPM were not directly comparable.[699]

Further, there are a number of possible explanations (for example, economic conditions) that do not imply a bias in beta. These explanations were noted by Partington and Satchell as well as Handley.[700] For example, Mujisson, Fishwick and Satchell (2014) found that beta for a given portfolio remains relatively constant despite changes in the interest rate and market movements. More discussion of these potential explanations is in sections B.2.2 and B.3.2.

In response to the AER's statement that results from NERA's February 2015 report are counterintuitive, HoustonKemp submitted that the results are not unusual and that many others have produced very similar results.[701] HoustonKemp noted that over the period 1979 through 2014 there has been a negative rather than a positive relation in Australia between average returns and estimates of their betas.[702] HoustonKemp submitted that Kan, Robotti and Shanken show that the GLS R2 associated with the CAPM exceeds zero because of a significant negative relation between the mean returns and betas.[703]

Partington and Satchell also note that ' a relatively flat or inverted relation between beta and realised returns is quite common in empirical work'.[704] However, they also note that it is not clear that this is evidence that other models are better at estimating expected return on equity, stating: [705]

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699 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 22–23.

700 Partington and Satchell, *Report to the AER: Return of equity and comment on submissions in relation to JGN*, May 2015, p. 16; Handley, *Advice on the rate of return for the 2015 AER energy network determination for Jemena Gas Networks*, 20 May 2015, p. 5.

701 HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 21.

702 HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 14.

703 HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 27.

704 Partington and Satchell, draft report, April 2015, p. 50.

705 Partington and Satchell, draft report, April 2015, p. 50.

> What this shows is that low beta shares have had realised returns that outperformed and high beta shares have had realised returns that underperformed relative to the CAPM equilibrium expected return benchmark. This may or may not be because the CAPM is a poor model of equilibrium returns and some examples of varying explanations are given in Handley (2014). Harvey, Liu and Zhu (2015) report more than 300 variables have been found significant in explaining the cross section of realised returns. Possibly one or several of these variables might explain the divergence of realised returns from the CAPM. The question is do any of these variables determine equilibrium expected returns and that is a question that is unresolved.

We consider the empirical information submitted in relation to the ex post performance of the different models does not show that our application of the Sharpe-Lintner CAPM will undercompensate the benchmark efficient entity for its efficient cost of equity. The benchmark firm is not average risk and its risk is not expected to change given its regulated monopoly nature. Empirical evidence by Professor Henry supports this and shows no clear evidence of mean reversion of risk towards the average risk of the market. Partington also observed Henry's result in advising that a Vasicek adjustment was not valid. He advised:[706]

> we note the work of Henry (2008), who finds no evidence that would support the use of the Vasicek model for Australian data. The results of the Henry (2008) study:
>
> > "… suggest that there is little convincing evidence of regression to unity in this data. Therefore, it is difficult to justify the application of the Blume or Vasicek adjustments." (p. 12)

HoustonKemp responded that an absence of mean reversion in betas will not guarantee that the use of the Sharpe-Lintner CAPM will generate estimates of the cost of equity capital for a benchmark efficient entity that are not downwardly biased.[707] In response, Partington and Satchell clarified their statements on mean reversion in beta. They noted that the absence of mean reversion indicates that measurement error in empirical tests is unlikely to be a source of low beta bias.[708]

B.1.3 Evidence from estimates of other models

Service providers submitted:

- the Black CAPM as evidence that the Sharpe-Lintner CAPM displays low beta bias (that is, downward biased for stocks with a beta of less than one)
- the Fama-French model as evidence that the Sharpe-Lintner CAPM displays book-to-market bias

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[706] Partington, *Report to the AER: Return on equity (updated), April 2015*, pp. 33–34.

[707] HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 22.

[708] Partington and Satchell, draft report, April 2015, p. 45.

- the dividend growth model as evidence that the Sharpe-Lintner CAPM, as applied by the AER, is not reflective of prevailing market conditions.

We note that the usefulness of the evidence provided from the Black CAPM, Fama-French model, and dividend growth model about possible bias in the Sharpe-Lintner CAPM is predominately in conjunction with empirical tests of these asset pricing models. That is, where multiple models are considered capable of providing appropriate estimates, tests of the relative performance of the models may be needed to determine if one model outperforms another. For example, empirical tests may be needed to determine if estimates from the Black CAPM (on their own) suggest downwards bias in the Sharpe-Lintner CAPM, or if they suggest upwards bias in the Black CAPM.

Our assessment of the empirical tests of the asset pricing models is set out in section B.1.2. Notwithstanding this assessment, we consider that there are significant limitations to the Black CAPM, Fama-French model, and dividend growth models. Given these limitations, we do not consider that these models provide compelling evidence that the Sharpe-Lintner CAPM, when used as our foundation model in our foundation model approach, is downwardly biased. Our assessment of the Black CAPM, Fama-French model, and dividend growth model are contained in sections B.2, B.3, and B.4 respectively.

B.2 Black CAPM

Fischer Black developed a version of the CAPM with restricted borrowing (the Black CAPM).[709] Black's model relaxes one of the key assumptions of the Sharpe-Lintner CAPM — that investors can borrow and lend unlimited amounts at the risk free rate. He developed two versions of the model; one with a total restriction on borrowing and lending and one that only restricts borrowing at the risk free rate. However, while he relaxes the Sharpe-Lintner CAPM assumption of unlimited borrowing and lending at the risk free rate, in its place he assumes investors can engage in unlimited short selling.[710] Unlimited short selling does not hold in practice either.[711]

In the place of the risk free asset in the Sharpe-Lintner CAPM, Black substitutes the minimum variance zero-beta portfolio. This zero beta portfolio faces no market (systematic) risk and is formed through the utilisation of short selling. Black shows in his model that the return on every asset is a linear function of its equity beta (as it is in the Sharpe-Lintner CAPM). Further, in the CAPM (security market line) equation, Black finds the expected return on the zero beta portfolio replaces the risk free asset.[712]

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709 Black, F., 'Capital market equilibrium with restricted borrowing', *The Journal of Business*, 45(3), 1972, pp. 444–455; McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 20.

710 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 22.

711 This assumption does not accord with how the stock lending markets work because short sellers are required to post collateral when lending stock in the form of cash and/or equity. See McKenzie and Partington, *Risk, asset pricing and WACC*, June 2013, p. 25.

712 Black, F., 'Capital market equilibrium with restricted borrowing', *The Journal of Business*, 45(3), 1972, pp. 446–450.

Relative to the Sharpe-Lintner CAPM that can utilise observable proxies for the risk free rate, the Black CAPM requires estimating an additional parameter — the zero beta expected return.

We have reviewed the material submitted to us[713] on the Black CAPM and we do not consider that estimating the Black CAPM will result in a return on equity commensurate with the efficient financing costs given the risk of JEN's regulated services. We maintain our reasons for this position as set out in the Guideline's explanatory statement and its appendices.[714]

Therefore, our approach is to:

- use the theory behind the Black CAPM to inform the equity beta estimate in the Sharpe-Lintner CAPM.
- not use the Black CAPM to empirically estimate the return on equity for the benchmark efficient entity.

Our use of the Black CAPM is due to the following reasons:

- The empirical implementation of the Black CAPM is unreliable because, in contrast to the risk-free rate, the expected return on the zero beta asset is unobservable and there is no apparent consensus on methods for estimating this return. The lack of consensus on methodological choices is likely to increase the sensitivity of the model to such choices, reducing the reliability of the model and increasing the potential for bias.
- There is little evidence that other regulators, academics or market practitioners use the Black CAPM to estimate the return on equity.[715] In particular, regulators rarely have recourse to the Black CAPM.[716] This view was supported by Handley.[717]
- Implementation of the Black CAPM typically results in estimates of the zero beta return being less reflective of prevailing market conditions than risk free rate estimates.[718]

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[713] Frontier Economics, The *required return on equity under a foundation model approach – Report prepared for Jemena Electricity Networks, ACTEWAGL Distribution, AusNet Services, Australian Gas Networks, CitiPower, Powercor and United Energy*, January 2016; HoustonKemp, *The Cost of Equity: Response to the AER's draft decisions for the Victorian Electricity Distributors, ActewAGL Distributors and Australian Gas Networks*, January 2016; Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016.

[714] AER, *Rate of return guideline*, 17 December 2013, p. 13; AER, *Explanatory statement rate of return guideline*, 17 December 2013, pp. 57–72; AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 18–23.

[715] For more detail, see the 'use in practice' subsection in section A.3.3 of Attachment 3 to our preliminary decision for JEN, which remains relevant here. No new material was submitted on this issue following our preliminary decision.

[716] A recent study examined regulatory practices in 21 countries and did not point to any uses of the Black CAPM. See Schaeffler, S., and Weber, C., 'The cost of equity of network operators - empirical evidence and regulatory practice', *Competition and Regulation in network industries*, Vol. 14(2), 2013, p. 386.

[717] Handley, *Advice on return on equity,* 16 October 2014, p. 12.

- Using a conservative estimate of beta in the Sharpe-Lintner CAPM can accommodate potential issues that arise from not estimating the Black CAPM.[719]

We elaborate on our reasons for these positions in sections B.2.1 to B.2.3 below.

Service providers proposed that empirical estimates from the Black CAPM should be used for estimating the return on equity.[720] In support of using empirical return on equity estimates from the Black CAPM, service providers submitted that:

- Empirical evidence indicates that the 'SL-CAPM will lead to downwardly biased estimates of the return on equity for low-beta stocks.[721]
- The AER cannot reject the use of the Black CAPM based on concerns with reliability without testing SFG's zero-beta premium or 'seeking a reliable estimate' of the premium[722]

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718 As the zero beta portfolio can take many years of data to estimate, while the current government bond rate is readily available. See: Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, p. 20.

719 Handley found, 'The AER's choice in using the Black CAPM to inform the beta estimate, using the DGM to inform the MRP estimate and not using the Fama-French model is also appropriate and reasonable' in *Advice on the return on equity*, 16 October 2014, p. 5. McKenzie and Partington advised the theory underpinning the Black CAPM does not necessarily support an uplift to beta. McKenzie and Partington advised, 'the theory of the Black CAPM may have a role to play in choosing the equity beta, although exactly how is still not clear to us' in *Report to the AER part A: Return on equity*, October 2014, p. 24.

720 CitiPower, *Regulatory proposal 2016-2020*, April 2015, p. 205–212; CitiPower, Revised r*egulatory proposal 2016-2020*, January 2016, p. 325–326; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 319–320; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 104–105; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 37–38; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 44–45 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 42–46, 83–84, 120–121; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 38–39; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 73, 75–77.

721 CitiPower, Revised r*egulatory proposal 2016-2020*, January 2016, p. 286–289; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 280–282; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 57–64; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 41–46; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 47–52 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 46–48; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 41–43; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, pp. 115–120

722 CitiPower, *Revised regulatory proposal 2016-2020*, January 2016, p. 293–294; ; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 287–288; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 66–67; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 45–49; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft*

- The AER's return on equity estimate is below those from other relevant return on equity models.[723]
- Consultant reports show that the Black CAPM is used in rate of return regulation cases.[724]

Having considered these submissions, we do not find them compelling and we remain satisfied with our position in the Guideline and preliminary decision. We consider that the Black CAPM is too sensitive to implementation choices for which there is no general consensus. This may also explain its lack of use. We do not consider that Black CAPM estimates would contribute to a return on equity commensurate with efficient financing costs given JEN's risk in providing regulated services. We elaborate on our response to these submissions in sections B.2.1 to B.2.3 below.

B.2.1 Empirical reliability of the Black CAPM

We consider that there appears no consensus on the methodological choices required to construct a zero-beta portfolio.

McKenzie and Partington indicated that the Black CAPM can be very sensitive to implementation choices.[725] Partington and Satchell noted that, irrespective of the name

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decision: Attachment 10.26 Response to draft decision: rate of return, January 2016, pp. 54 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 53–54; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 48–49; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp.70 ; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, pp. 115–120.

723 CitiPower, *Revised regulatory proposal 2016-2020*, January 2016, p. 285; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, p. 279; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 54–56; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 37–40; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 45–46 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 43–45; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 39–40; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 73–77.

724 CitiPower, *Revised regulatory proposal 2016-2020*, January 2016, p. 296; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, p. 290; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 69–70; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp.50–51; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, p. 56 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 54–56; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, p. 50.

and framework (the Black, Vasicek and Brennan versions of the CAPM), the major issue with zero beta CAPMs is determining the return of the zero beta portfolio.[726] They noted Beaulieu, Dufour and Khalaf's conclusion that the estimate of the zero beta return is unstable and unreliable over time.[727] Partington recommended against using empirical estimates of the Fama French model and Black CAPM in the Australian context because many of the issue are 'virtually intractable and estimates, such as those of the zero beta return are so problematic and unreliable as to render them virtually worthless'.[728]

The instability of the Black CAPM is highlighted in NERA's report for TransGrid's revenue proposal. This report lists the following prior estimates of the zero beta return for the Australian market:[729]

- CEG (2008) reports zero beta premium estimates between 7.21 and 10.31 per cent per annum.
- NERA (2013) reports zero beta premium estimates between 8.74 and 13.95 per cent per annum.

NERA also acknowledged that:[730]

> estimates of the zero-beta premium produced by studies that use long time series of Australian data are generally larger than estimates of the MRP that the AER has in the past used.

NERA also acknowledged the implausibility of the zero beta premium being equal to the market risk premium. However, NERA claimed the result simply reflects that there is no relationship between systematic risk and return.[731] Similarly, SFG submitted that imprecise estimates of the zero beta premium arose from the imprecision in the relationship between beta and stock returns.[732] We do not find these submissions compelling. As stated by Handley, NERA's results that the zero beta premium equals the market risk premium have an unsettling implication that, 'there is a minimum variance portfolio that has no exposure to the risk of the market but is still expected to yield the same return as the market portfolio.'[733] We also question the validity of applying an asset pricing model that prices assets on the basis of equity beta, in a

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725 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 25; Partington, *Report to the AER: Return on equity (updated), April 2015*, pp. 44–45.

726 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, pp. 25–26.

727 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, pp. 19 & 26.

728 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, p. 18.

729 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 91

730 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 91.

731 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 92.

732 SFG, *Beta and the Black CAPM*, February 2015, p. 8; SFG, *The foundation model approach of the Australian Energy Regulator to estimating the cost of equity*, March 2015, p. 24.

733 Handley, *Advice on return on equity,* 16 October 2014, p. 12. Handley does indicate the plausibility of this would depend on the variance of this portfolio and notes the minimum variance zero beta portfolio may bear unsystematic risk.

situation where one does not consider there is a relationship between equity beta and required return.

Partington and Satchell also noted that Shanken has cautioned using the method by Litzenburger and Ramaswamy and Shanken (used by NERA) to estimate the zero-beta premium because such procedures can lead to unreliable estimates.[734]

NERA's 2012 submission further illustrates the unreliability of the Black CAPM. This presented estimates of a Black CAPM that implied a negative market risk premium.[735]

SFG acknowledged that one might expect the zero beta return to lie below the expected return on the market.[736] SFG estimated an estimate of the zero beta premium of 3.34 per cent per annum.[737] It then attempted to reconcile its estimate with NERA's and stated:[738]

> When we formed portfolios to measure the relationship between beta estimates we formed portfolios that had approximately the same industry composition, market capitalisation, and book-to-market ratio. So we isolated the relationship between stock returns and beta estimates that was largely independent of other stock characteristics that are associated stock returns. We repeated our analysis after forming portfolios entirely on the basis of beta estimates and found that the zero beta premium was 9.28%. This estimate of the zero beta premium is almost identical to the portfolio return of 10.03% reported by NERA for the 19-year period from 1994 to 2012.

We consider SFG's latest estimate of the zero beta premium appears more plausible, as it is not negative and is below the market risk premium. However, we remain of the view that the large range of zero beta estimates by consultants indicates that the model is unsuitable for estimating the return on equity for the benchmark efficient entity. McKenzie and Partington also considered SFG's and NERA's submissions and remained of the view that the model is empirically unstable. They stated:[739]

> Our point that 'what you get depends very heavily on what you do' is well illustrated by the SFG estimate of the zero beta premium, which is quite different to the NERA estimate

SFG later characterised this logic as not placing reliance on a 'plausible' estimate simply because different approaches produced implausible estimates.[740] Having reviewed SFG's report, Partington advised:[741]

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734 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, p. 26.

735 NERA, *The Black CAPM: A report for APA Group, Envestra, Multinet and SP AusNet*, March 2012. For a response to this submission, see McKenzie and Partington*, Review of NERA report on the Black CAPM*, 24 August 2012.

736 SFG, *Cost of Equity in the Black Capital Asset Pricing Model*, 22 May 2014, p. 3.

737 SFG, *Cost of Equity in the Black Capital Asset Pricing Model*, 22 May 2014, p. 3.

738 SFG, *Cost of Equity in the Black Capital Asset Pricing Model*, 22 May 2014, pp. 3–4.

739 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24; Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 44.

740 SFG, *Beta and the Black CAPM*, February 2015, pp. 19–20.

741 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 12.

> There are a great number of practical difficulties to be confronted when implementing the Black CAPM such that McKenzie and Partington (2014) do not recommend any weight be given to the estimates provided in the network service providers consultants reports. This is an important point as McKenzie and Partington (2014) do not suggest that the Black model cannot be estimated. Indeed, the consultants reports clearly show that it can be done. What they do say however, is that it is unclear what those estimated represent.

We received a number of submissions from the service providers and their consultants on the Black CAPM for this decision. However, they largely surround issues previously considered in our Guideline and/or previous decisions.[742] We focus on key aspects of these submissions below. In response to our concern with the reliability of the zero beta premium, service providers submitted that the AER has not sought to test SFG's proposed zero-beta premium and instead dismissed this estimate on the basis that there are other differing estimates, some of which are 'implausible'.[743]

Service providers considered that, given the Black CAPM is a relevant model, a proper examination should be undertaken for the best estimate for the zero-beta premium and this value should be used instead of effectively assuming this to be zero (by relying solely on the Sharpe-Lintner CAPM to estimate the return on equity).[744]

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742 AER, *Preliminary decision: CitiPower determination 2016–2020: Attachment 3–Rate of return*, October 2015, pp. 306–316; AER, *Powercor Preliminary Decision - Attachment 3: Rate of Return*, October 2015, pp. 306–316; AER, *Draft decision ActewAGL distribution determination 2016 to 2021: Attachment 3 – Rate of return*, November 2015, p. 320; AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 308–318; AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 16–18; AER, *Draft decision Australian Gas Networks access arrangement 2016 to 2021–Attachment 3: rate of return*, November 2015, pp. 313–322; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 307–317; AER*, Preliminary decision AusNet Services determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 306–316; AER, *Draft decision Amadeus Gas Pipeline access arrangement 2016 to 2021: Attachment 3¬–Rate of return*, November 2015, pp. 74–78.

743 CitiPower, *Revised Regulatory Proposal 2016–2020*, January 2016, p. 293; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, p. 287; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 66–67; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 44–46, 51–52; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 54–58 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 53–54; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 48–49; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, p. 70.

744 CitiPower, *Revised Regulatory Proposal 2016–2020*, January 2016, p. 290–293; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, p. 285–287; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 66–67; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp.45–46, 48–49; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 44, 47–52 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp.

Partington and Satchell continue to note a range of issues (some of which are long-standing) with the Black CAPM in their latest report:

- Examinations of important academic research on the Black CAPM show that it is based on a number of unrealistic assumptions, such as unrestricted short-selling.[745] In particular, the 1971 Brennan paper indicates that the Black CAPM is unsuitable for regulatory use due to its assumption of two Markowitz portfolios as we cannot be certain what the properties of the market portfolio actually are.
- There are a range of issues with implementing the Black CAPM.[746] For example, the zero-beta premium is not observable and different methods and assumptions can lead to very different estimates of the zero-beta premium. In particular, the variability in zero-beta premiums is evident in SFG's estimate (10.75 per cent) and NERA's estimate (3.43 per cent).
- The zero beta premium estimates is not current nor observable and the standard errors of the estimates are substantial.[747]

After reviewing the material submitted to us, we are satisfied that we do not need to estimate the Black CAPM.

In response to Partington and Satchell's October 2015 advice, HoustonKemp submitted analysis showed that none of the estimates are either extremely large and negative or extremely large and positive. HoustonKemp submitted that the recursive estimates of the zero-beta premium have been relatively stable for the last 30 years and do not appear to be either problematic or unreliable.[748]

Based on a visual interpretation of its figure 4 in HoustonKemp's report, more than half of the zero beta premium estimates are concentrated in the 5% bar. HoustonKemp's recursive estimate of the zero beta premium (figure 5) indicates a value around 7–8% in 2014. We consider that both charts indicate a large and positive premium, relative to our estimated range for the market risk premium. Further, we note that the 95% confidence interval captures a range of approximately 4–13% which suggests not insignificant uncertainty regarding the zero beta premium estimate.

53–54; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 38–39; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 69–73.

745 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 34-37.

746 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 39–45.

747 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 44–45.

748 HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks,* January 2016, p. viii, 25–28.

HoustonKemp made the following submissions on Beaulieu, Dufour and Khalaf's conclusion that the estimate of the zero beta return is unstable and unreliable over time:[749]

> Beaulieu, Dufour and Khalaf's finding relates to unreliable zero-beta rate estimates for assets with true betas that are close to one. HoustonKemp has used data from the largest stocks[750] to compute its zero-beta premium and it is unlikely that all of these stocks have true betas that are close to one.

Partington and Satchell noted that the estimation problems set out in Beaulieu, Dufour and Khalaf remain relevant even for assets with estimated betas not close to one. Partington and Satchell stated:[751]

> [Beaulieu, Dufour and Khalaf (2012) states that] even if estimated betas are not close to one, irregularities associated with WI [weak identification] are not at all precluded [in view of (1) and (2) above]…
>
> [Their statement states that] even if the estimated betas are not close to one, this is not a sufficient condition to preclude problems of estimation and inference.
>
> The implicit argument [by HoustonKemp] is that any instability in estimates of the zero beta return is due to variation in the risk free rate. Thus eliminating the risk free rate fixes the stability problems in the zero beta rate by transforming it to a zero beta premium. This is a dubious proposition, which we find completely unconvincing.

HoustonKemp submitted that Partington and Satchell's finding of Kan, Robotti and Shanken's zero-beta estimate being implausibly high ignores the fact that there is no sign the authors consider their estimate unreliable. [752]

We note Partington previous and latest advice regarding issues with implementing the Black CAPM, including the unreliable nature of (and wide range for) the zero beta estimate.[753] We also consider that Kan, Robotti and Shanken's caution reinforces our view that the model is not empirically reliable.[754] Partington and Satchell advise that

749 Houston Kemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks,* January 2016, p. 26.

750 HoustonKemp used the largest 100 stocks from 1963 to 1973 and the largest 500 stocks from 1974 to 2014

751 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp. 42–43.

752 Houston Kemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks,* January 2016, p. 28.

753 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24; Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 44; October 2015, p. 19; Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations,* April 2016, pp. 39–46.

754 AER, SAPN final decision: Attachment 3–Rate of return, October 2015, p. 76–79; AER, *Preliminary decision: CitiPower determination 2016–2020: Attachment 3–Rate of return*, October 2015, pp. 306–316; AER, *Powercor*

the Black CAPM is based on a number of unrealistic assumptions and can lead to a wide range (and unreliable) estimates depending on the method used.[755]

HoustonKemp submitted in respect of the asset pricing tests in Lewellen, Nagel and Shanken:[756]

- Lewellen, Nagel and Shanken find that there is little relation between mean return and beta, and that estimates of the zero-beta premium are large and both economically and statistically significant.
- Lewellen, Nagel and Shanken find statistically significant evidence that the Sharpe-Lintner CAPM will deliver downwardly biased estimates of the returns required on low-beta portfolios of stocks.

However, Partington and Satchell cautioned use of results from asset pricing tests:[757]

> we have also pointed out (see for example, Partington and Satchell 2015a and 2015b) that there is well regarded research which shows that there are substantial methodological and statistical problems associated with asset pricing tests, for example, that results depend on how the portfolios used in the tests are formed.
>
> These papers also illustrate that the tide of academic opinion is divided about the evidence from realised returns, both for and against the CAPM. In short there is ongoing debate about how asset pricing tests should be conducted, what test statistics are appropriate, and what such tests actually mean.

B.2.2 Low beta bias may not reflect ex ante priced risk

Service providers submitted that the Sharpe-Lintner CAPM underestimates the return on equity for businesses with an equity beta less than one ('low beta bias'). Service providers submitted that low beta bias is evidenced by the return on equity estimates

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Preliminary Decision - Attachment 3: Rate of Return, October 2015, pp. 306–316; AER, *Draft decision ActewAGL distribution determination 2016 to 2021: Attachment 3 – Rate of return*, November 2015, p. 316–325 ; AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 308–318 ; AER, *Draft decision Australian Gas Networks access arrangement 2016 to 2021–Attachment 3: rate of return*, November 2015, , pp. 313–322; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 311–313; AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 16–18; AER*, Preliminary decision AusNet Services determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 75–78, 306–316; AER, *Draft decision Amadeus Gas Pipeline access arrangement 2016 to 2021: Attachment 3¬–Rate of return*, November 2015, pp. 74–77, 310–319..

755 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp. 34-37, 44–45.

756 HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks,* January 2016, p. 18.

757 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp. 38–39.

from Black CAPM and the empirical performance of the Sharpe-Lintner CAPM using ex post data.[758]

The empirical performance of the Sharpe-Lintner CAPM using ex post data is discussed in detail in section B.1.2. We acknowledge that the Sharpe-Lintner CAPM tests poorly using ex post returns data, and appears to underestimate the ex post returns for businesses with an equity beta less than one. However, we do not consider that this result is evidence that the set of assumptions underpinning the Black CAPM are more realistic than those underpinning the Sharpe-Lintner CAPM.

Handley stated that the Black CAPM and low beta bias are not equivalent concepts. As such, the empirical results of Black Scholes and Jenson (1972) and Fama and French (2004) are not direct tests of the Black CAPM.[759] It is unclear that low beta bias is a priced risk not already captured by the Sharpe-Lintner CAPM.[760] Handley later reiterated that our understanding of the low beta bias is still far from clear.[761]

McKenzie and Partington indicated that the Black CAPM is not based on more realistic assumptions than the Sharpe-Lintner CAPM. In fact, Partington and Satchell show that the Black CAPM is based on a number of unrealistic assumptions, such as unrestricted short-selling.[762]

The Black CAPM cannot be directly compared to the Sharpe-Lintner CAPM as they each involve very different investment strategies.[763] As such, any attempt to compare the two models must be done with great care.[764]

Partington and Satchell noted that 'low beta bias' represents a tendency for low beta stocks to overperform and high beta stocks to underperform relative to the CAPM. Partington and Satchell noted that one possible interpretation is not necessarily that the Sharpe–Lintner CAPM gives a downward biased estimated of required returns but

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[758] CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 286–298; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 280–292; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 57–72; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 41–46; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 47–58; ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 45–54; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp 39–52; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, p. 70; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, pp. 115–120, 129–130.

[759] Handley, *Advice on return on equity,* 16 October 2014, p. 10.

[760] Handley, *Advice on return on equity,* 16 October 2014, p. 11.

[761] Handley*, Report prepared for the AER: Further advice on the return on equity*, April 2015, p. 6.

[762] Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 34-37.

[763] McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 22–23.

[764] Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 16.

that low beta stocks have positive 'alphas'.[765] We note that a myriad factors can contribute to the under and over performance of a stock. Partington and Satchell noted that the question of whether any of these variables determine equilibrium expected returns is currently unresolved.[766]

B.2.3 AER's role for the theory of the Black CAPM

We consider that the Black CAPM cannot be reliably estimated and we should not place weight on return on equity estimates from the model. However, we consider the theoretical underpinnings of the model remain a relevant consideration.

The theoretical principles underpinning the Black CAPM demonstrate that market imperfections could cause the true (unobservable) expected return on equity to vary from the Sharpe-Lintner CAPM estimate. This is a result of slightly different starting assumptions between the models.[767] The resulting variation in expected return on equity is (in the theoretical principles) larger for businesses with equity betas further from one. We have also considered the empirical evidence that the Sharpe-Lintner CAPM tends to underestimate returns on low beta stocks when examined using ex-post data.

Our empirical and conceptual analysis of equity beta for businesses with a similar degree of risk as JEN (in the provision of regulated services) indicates an equity beta less than one, and within the range of 0.4 to 0.7.[768] In this case, where initial considerations indicate an equity beta materially below one, the theory of the Black CAPM may be relevant. As the importance of the theory of the Black CAPM is relative to considerations of the business' equity beta estimate, we consider it is appropriate for the theory of the Black CAPM to inform our equity beta estimate.

However, it is important to note that:

- All models with simplifying assumptions will likely be affected by market imperfections when they are applied in a practical setting. The key theoretical difference between the Black CAPM and the Sharpe-Lintner CAPM relates to borrowing and lending. The Sharpe-Lintner CAPM assumes that investors can access unlimited borrowing and lending at the risk free rate. The Black CAPM relaxes this assumption, and instead assumes that investors can access unlimited

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765 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 9.

766 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 51.

767 Fischer Black's 1972 paper on the Black CAPM develops two model specifications. The base specification assumes no risk free asset exists (no risk free borrowing or lending). The second specification assumes that the representative investor can lend but not borrow at the risk free rate. In the base specification, the return on the zero beta portfolio can be above the risk free rate. In the second specification, the return on the zero beta portfolio must be above the risk free rate. See: Black, *Capital market equilibrium with restricted borrowing*, Journal of Business 45(3), July 1972, pp. 452–454.

768 For more detail, see section 3.4.1.

short selling of stocks, with the proceeds immediately available for investment. Either of these assumptions might correctly be criticised as being unrealistic, and it is not clear which assumption is preferable.

- We consider that we cannot reliably estimate the Black CAPM.
- The empirical tests of the Sharpe-Lintner CAPM using ex-post data do not provide conclusive evidence that the Sharpe-Lintner CAPM has 'low beta bias'.

Our use of the Black CAPM in informing the equity beta point estimate is supported by recent advice from our expert consultants, McKenzie and Partington and John Handley.

John Handley noted our use of the Black CAPM to inform the beta estimate, as well as our roles for the dividend growth model and the Fama-French model, as 'appropriate and reasonable'.[769]

McKenzie and Partington considered that while the empirical implementation of the Black CAPM is problematic, the theory underlying the Black CAPM may have a role in informing the equity beta estimate.[770] McKenzie and Partington noted there is considerable uncertainty in how the Black CAPM theory should be applied to a Sharpe-Lintner CAPM equity beta estimate. However, they considered the theory underlying the Black CAPM does not necessarily support an uplift to the equity beta estimate used in the Sharpe-Lintner CAPM.[771]

We agree with McKenzie and Partington that the Black CAPM (of itself) does not justify an uplift to the equity beta used in the Sharpe-Lintner CAPM.[772] However, we have had regard to it when exercising our regulatory judgment in selecting the equity beta. We consider the Black CAPM does demonstrate that market imperfections could cause the true (unobservable) required return on equity to vary from the Sharpe-Lintner CAPM-based estimate. We consider this a relevant consideration in selecting the equity beta.

Some service providers have submitted that we have adjusted the equity beta for the Black CAPM in order to provide a correction for low beta bias.[773] Other service

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769 John Handley, *Advice of the return on equity*, October 2014, p. 5

770 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 24–25; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 44–45.

771 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 24; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 44.

772 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24; Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 44.

773 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 290–292; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 284–286; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 62–64; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 41–46, 51–52; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp.51–52 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp.

providers submitted that it is not clear whether our equity beta estimate is intended to correct for bias in the Sharpe-Lintner CAPM.[774] We do not consider that service providers have shown that low beta bias exists on an ex ante basis and that it reflects a priced risk factor that would contribute to the allowed rate of return objective. We also note that the theory of the Black CAPM is only one consideration informing our equity beta point estimate (for more detail, see the 'estimating equity beta' subsection in section 3.4.1).

SFG, Frontier, and Houston Kemp submitted it is not possible to have proper regard to the Black CAPM without estimating it, and that we have essentially computed an unspecified estimate of the zero-beta premium.[775] We do not consider that the Black CAPM can be reliably estimated, and therefore consider that proper regard to the model requires that we do not place weight on estimates from the model and do not estimate the zero-beta premium.

HoustonKemp submitted that we adjust upwards an estimate of 0.55 – the midpoint of the range of 0.4 to 0.7 – to 0.7 by placing a weight of two thirds on an unadjusted estimate of beta (0.55) and one third on one.[776]

We note that our equity beta estimate of 0.7 is informed by a range of relevant evidence[777] and based on exercise of our regulatory judgment. It is not determined in any mechanistic manner as suggested by HoustonKemp.

50–51; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 45–47.

774 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, p. 290; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, p. 284; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 62–64; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 45–46; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 51 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016,pp. 50–51; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 45–47; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 74–75.

775 SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 23–24, 35; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, pp. 16–17; SFG, *The required return on equity for the benchmark efficient entity*, February 2015, p. 19; Frontier Economics, *Key issues in estimating the return on equity for the benchmark efficient entity*, June 2015, p. 7; HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 10.

776 HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks,* January 2016, p. 9.

777 AER, SAPN final decision: Attachment 3–Rate of return, October 2015, p. 94–96. ; AER, *CitiPower Preliminary Decision - Attachment 3: Rate of Return*, October 2015, pp91–93, 127–133; AER, *Powercor Preliminary Decision - Attachment 3: Rate of Return*, October 2015, pp. 92–94, 127–133; AER, *Draft decision ActewAGL distribution determination 2016 to 2021: Attachment 3 – Rate of return*, November 2015, pp. 94–97, 130–136; AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 92–94; AER, *Draft decision Australian Gas Networks access arrangement 2016 to 2021–Attachment 3: rate of*

In its June 2015 and January 2016 reports, Frontier maintained its disagreement with our use of the theory underlying the Black CAPM to inform the equity beta point estimate.[778] We do not consider that Frontier have raised any substantive new evidence to support their views. Therefore, we maintain the position and reasoning set out above.

The Consumer Challenge Panel agreed with our view on the difficulties with empirically implementing the Black CAPM. However, it disagreed with our use of the theory underlying the Black CAPM to inform the equity beta point estimate.[779] The Consumer Challenge Panel stated:[780]

> We have discussed our concerns with the Black CAPM above and do not consider it is an appropriate basis for the AER to select an equity beta that is higher than the median of the empirical observations.

We consider the Consumer Challenge Panel's submission merely reflects a difference in opinion on the usefulness of qualitative evidence from one model to inform a parameter estimate in another model.[781] We note that the theory of the Black CAPM was only one factor that informed our equity beta point estimate.

In submissions on service providers' proposals, there was broad agreement from consumer groups on the application of our foundation model approach as set out in our Guideline.[782] We consider that this refers to the Guideline in its entirety, including our role for the theory of the Black CAPM.

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return, November 2015, pp. 93–95; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 92–94; AER*, Preliminary decision AusNet Services determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 92–94; AER, *Draft decision Amadeus Gas Pipeline access arrangement 2016 to 2021: Attachment 3¬–Rate of return*, November 2015, pp. 93–95.

778 Frontier, *Key issues in estimating the return on equity for the benchmark efficient entity*, June 2015, pp. 48–50, 61; Frontier, *The required return on equity under a foundation model approach*, January 2016, pp. 40–41.

779 CCP3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, August 2015, pp. 64–67, CCP2 (Bruce Mountain), *Submission on the AER's preliminary decisions for the Qld/SA distribution network service providers (2015-20)*, 29 July 2015, p. 10. QCOSS similarly disagreed with our use of the theory underlying the Black CAPM to inform the equity beta point estimate (see QCOSS, *Response to Australian Energy Regulator Preliminary Decision for Queensland distributors 2015-2020*, 3 July 2015, pp. 22–24).

780 CCP3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, August 2015, p. 67.

781 In the Guideline we clearly explained why we use the theory underlying the Black CAPM to inform the equity beta point estimate. See AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 71–72.

782 We received submissions from nine consumer groups that provided clear submissions on the approach for estimating the rate of return. No submission opposed the application of our Guideline for estimating the return on equity.

B.3 Fama-French model

The Fama-French model is a three factor model of asset returns.[783] It incorporates the following three risk factors:[784]

- the return on the market (thus it incorporates the CAPM's systematic risk factor by having the return on the market as a factor)
- firm size (measured by market capitalisation)
- the ratio of book value to market value.

We have reviewed all the material submitted to us[785] on the Fama-French model and decided to give the model no role in informing our return on equity estimate (either directly or through informing parameter estimates). We maintain our reasons for this position as set out in the Guideline's explanatory statement and its appendices.[786] We do not consider that using the Fama-French model will result in a return on equity commensurate with the efficient financing costs given the risk of JEN's regulated services.

Our reasons for giving the Fama-French model no role are:

- Empirical implementation of the Fama-French model is relatively complex and opaque, with no apparent consensus on the factors to be included or the construction of portfolios for the factors. Its estimates are sensitive to the chosen estimation period and methodological assumptions.
- The ex-post (backward looking) observation of apparently priced risk factors does not mean these factors are priced ex-ante (on a forward looking basis).
- There is a lack of agreed-upon theoretical foundation for the factors and the instability of parameter estimates. This may be a contributing factor to the lack of consensus on the empirical implementation of the Fama-French model. It also increases the difficulty associated with ascertaining whether the ex post observation of apparently priced risk factors are priced ex ante. [787]

783 Fama, E.F., French, K.R., 'The cross section of expected stock returns', *The Journal of Finance*, 47, 1992, pp. 427–66.

784 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 15–16.

785 Frontier Economics, The *required return on equity under a foundation model approach – Report prepared for Jemena Electricity Networks, ACTEWAGL Distribution, AusNet Services, Australian Gas Networks, CitiPower, Powercor and United Energy*, January 2016; HoustonKemp, *The Cost of Equity: Response to the AER's draft decisions for the Victorian Electricity Distributors, ActewAGL Distributors and Australian Gas Networks*, January 2016; Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016.

786 AER, *Rate of return guideline*, 17 December 2013, p. 13; AER, *Explanatory statement rate of return guideline*, 17 December 2013, pp. 57–72; AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 18–23.

787 For more discussion of the theoretical foundations of the Fama-French model, see the 'theoretical foundations' subsection in section A.3.2 of Attachment 3 to our preliminary decision for JEN, which remains relevant here.

- There is little evidence of companies or regulators using the Fama-French model to estimate the return on equity.[788]

There is no single correct application of the Fama-French model. There are numerous specifications of the model that produce different estimates of the return on equity. The lack of consensus on both the relevant factors and methodological choices is likely to increase the sensitivity of the model to such choices, reducing the reliability of the model and increasing the potential for bias. It is unclear that any of the different return on equity estimates from the different model specifications reflect an ex ante required return for risk. It is also unclear if any of the different specifications would be capable of estimating the required return on equity of investors in a business with a similar degree of risk as JEN in providing regulated services, even if they were capable of estimating required returns for the average firm. We set out these issues in more detail in the subsections below.

McKenzie and Partington have also previously supported our decision to not use the model.[789] We consider Handley's comments on the model also support our decision to not use the Fame-French model.[790]

The Energy Consumers Coalition of South Australia (ECCSA) agreed with the role we assign to the Fama–French model. ECCSA rejected the associated proposal by the networks to use multiple models to assess the outcomes then weighting these models to arrive at a point estimate.[791]

The Consumer Challenge Panel was also unconvinced by arguments from the various service providers for the AER to use models other than the Sharpe-Lintner CAPM for estimating the cost of equity. The Consumer Challenge Panel considered that these alternative models are currently not being utilized by academics nor valuation practitioners.[792] Similarly, the Victorian Energy Consumer and User Alliance (VECUA) considered that our approach to estimating return on equity is more appropriate than the distributors' proposed approaches that adopt weighted averages of different return

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788 For more detail, see the 'use in practice' subsection in section A.3.2 of Attachment 3 to our preliminary decision for JEN, which remains relevant here. No new material was submitted on this issue following our preliminary decision.

789 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 15–19. Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 11; Partington & Satchell, *Report to the AER: return on equity and comment on submissions in relation to JGN*, May 2015, p. 6.

790 Handley, *Advice on return on equity,* 16 October 2014, pp. 7–10. We reengaged Handley to consider material submitted with service providers' revised proposals. It does not appear that this material caused Handley to change his earlier positions. See Handley, *Further advice on the return on equity*, March 2015, pp. 3–4; Handley, *Advice on the rate of return for the 2015 AER energy network determination for Jemena Gas Networks*, 20 May 2015, pp. 24, 28.

791 ECCSA, *Submission on Australian Gas Networks' Access Arrangement Proposal 2016-2021*, 16 August 2015, p.58.

792 Mr Bruce Mountain, *CCP2, Advice on AER preliminary decisions and revised proposals from Energex, Ergon Energy and SA Power Networks*, July 2015, p.113

on equity models. These proposed departures have not been subjected to any rigorous analysis or stakeholder consultation.[793]

Service providers responded to our reasons for giving the Fama-French model no role, submitting that:[794]

- The Fama-French model performs better than the Sharpe-Lintner CAPM.[795]
- All models requiring parameter estimates are sensitive to those estimates, including the Sharpe-Lintner CAPM, and the Fama-French model is not materially more sensitive to input choices than the Sharpe-Lintner CAPM.
- HoustonKemp noted that the Fama-French model was developed to address mis-pricing on low-cap and value stocks.[796]

HoustonKemp submitted that, in examining the performance of a five factor model, Fama and French do not suggest that they consider the three-factor model to provide estimates of the returns required on equities to be inferior to those produced by the Sharpe-Lintner CAPM.[797]

We are not satisfied with these arguments. Partington and Satchell's latest report also advised against using the Fama-French model:[798]

> 'one reason why regulators should be wary of the Fama-French approach is that there is considerable possible variation in the ways these factors can be constructed, which is one of the reasons that these factors are favoured by the

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793 Victorian Energy Consumer and User Alliance, *Submission to the AER Victorian Distribution Networks' 2016-20 Revenue Proposals*, 13 July 2015, p.10.

794 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, p. 289, 292, 294-295; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 283, 286, 288–289; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 57–72; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 41–52; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 45–58 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 46–57; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp.41–50; APTNT*, Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision*, January 2016, pp. 68–72; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, pp. 126–128.

795 Frontier Economics, *Key issues in estimating the return on equity for the benchmark efficient entity*, June 2015, pp. 18–19; NERA, *The Cost of Equity: Response to the AER's final decisions for the NSW and ACT Electricity Distributors, and for Jemena Gas Networks*, June 2015, pp. 34 & 37; Frontier Economics, The *required return on equity under a foundation model approach – Report prepared for Jemena Electricity Networks, ACTEWAGL Distribution, AusNet Services, Australian Gas Networks, Citipower, Powercor and United Energy*, January 2016,p. 58-65

796 HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 5.

797 HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks,* January 2016, p. 27.

798 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp. 33–34.

> financial sector; they can be customised. Also, there is no theory attached to such a model; this has the implication that we do not really know if these factors represent risks, alpha opportunities, or behavioural anomalies. By contrast, the CAPM is a simple but self-contained theory of equilibrium pricing; the single factor, the market, is clearly identifiable as a risk factor and this makes it much harder to manipulate once we agree upon the market portfolio and the choice of riskless asset.

Further, Partington and Satchell noted that the Fama-French model is a model that that is still to gain acceptance in the world of practice and is also being increasingly questioned.[799]. They advised that the model has not established itself in the role of estimating the cost of capital, it is increasingly being challenged and currently it is in a state of flux with Fama and French having moved on to a new model.[800]

We have discussed the relative empirical performance of the Sharpe-Lintner CAPM in section B.1 above. We set out our response to the other issues in the following sections.

B.3.1 Sensitivity to methodological choices

There appears to be no consensus, and, indeed, nothing approaching a consensus, on the appropriate factors to use in factor modelling. McKenzie and Partington highlighted a vast array of models that add further factors to the Fama-French model. They pointed to one academic article that used over 50 variables to predict stock returns, and another that showed over 330 different predictive return signals.[801] They identified that Fama and French have proposed a five factor version of the model that they claim provides a better description of returns than their original three factor model.[802]

In addition to the appropriate factors to us in the model, there appears to be no consensus on the methodological choices for constructing the portfolios to proxy the chosen factors.[803] This lack of consensus on both the relevant factors and methodological choices is likely to increase the sensitivity of the model to such choices, reducing the reliability of the model and increasing the potential for bias and regulatory gaming.

Partington and Satchell noted that the Fama-French model can be manipulated through varying the number of factors and their definitions to choose a form that is

799 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 47.

800 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. .

801 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 16–17; Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 36.

802 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 16; Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 36.

803 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp. 32–34.

most favourable to certain arguments.[804] They noted that two advantages of the Sharpe-Lintner CAPM are its parsimony and greater observability which reduces opportunities for cherry picking and also provides the opportunity for a relatively transparent implementation.[805]

A recent study in the UK by Michou, Mouselli and Stark (2014) supports this conclusion.[806] A principal conclusion of Michou, Mouselli and Stark was that the results of the model are highly sensitive to the methodology chosen, so that 'factor construction methods can matter in the use of factor models and, as a consequence, factor construction methods need to be considered carefully in empirical settings'.[807] The Australian work of Brailsford, Guant and O'Brien (2012) noted that, regarding the Fama French model's specification choices, 'what appears to be relatively innocuous choices in portfolio construction can lead to substantially different conclusions'.[808] In contrast, we have a higher degree of confidence in our Sharpe-Lintner CAPM input parameters and resulting return on equity estimates.

Given the large range of potential factors used in factor modelling, as well as the contested and technical nature of this emerging body of research, we consider (at this time) factor modelling is unlikely to produce suitably reliable and unbiased estimates of the return on equity.

SFG did not consider the Fama-French model complex to implement, as it simply required estimating three factors instead of the one factor in the Sharpe-Lintner CAPM.[809] We do not agree. We consider that there is a much greater degree of consensus among academics and market practitioners on the methods and data sources for estimating the market risk premium and equity beta than there is for estimating the size and value factors in the Fama-French model.[810] Further, estimating the market risk premium and equity beta in the Sharpe-Lintner CAPM has resulted in a large amount of material being submitted by service providers, consultants and

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804 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 34.

805 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. .

806 Michou, M., Mouselli, S., Stark, A., 'On the differences in measuring SMB and HML in the UK - Do they matter?', *British Accounting Review*, Volume 30, 2014, pp. 1–14.

807 Michou, M., Mouselli, S., Stark, A., 'On the differences in measuring SMB and HML in the UK - Do they matter?', *British Accounting Review*, Volume 30, 2014, p. 12.

808 Brailsford, T., Guant, C., and O'Brien, M., 'The investment value of the value premium', *Pacific-Basin Finance Journal*, 20, 2012, p. 417.

809 SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2, 17–18.

810 AER, *Explanatory statement: Rate of return guideline*, 17 December 2013, pp. 90–91; Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 14; Partington & Satchell, *Report to the AER: return on equity and comment on submissions in relation to JGN*, May 2015, p. 6; Academic literature and reports submitted by service providers recognise that the available evidence for estimating the expected return on equity is imprecise and subject to varied interpretations. See for example R. Mehra and E. C. Prescott, The equity premium, A puzzle, *Journal of Monetary Economics*, 15, 1985, pp. 145–161; A. Damodaran, *Equity Risk Premiums (ERP), Determinants, Estimation and Implications*, September 2008, p. 1; J. S. Doran, E. I. Ronn and R. S. Goldberg, *A simple model for time–varying expected returns on the S&P 500 Index*, August 2005, pp. 2–3. For an example report from regulated entities, see: Officer and Bishop, *Market risk premium, a review paper*, August 2008, pp. 3–4.

consumer groups.[811] This material adds a large amount of complexity to the task of estimating a return on equity that contributes to the achievement of the allowed rate of return objective. Given this, we have no reason to consider that estimating two additional premiums and correlation coefficients would not add considerable complexity to our task.

Regarding sensitivity, SFG and Frontier considered all models requiring parameter estimates are sensitive to those estimates, including the Sharpe-Lintner CAPM.[812] While we recognise that all models can be sensitive, we are not satisfied that the sensitivity of the Fama-French model is comparable to the Sharpe-Lintner CAPM.

SFG appears to suggest that the sensitivity arising from the Sharpe-Lintner CAPM is due to the market factor. We have no reason to expect that adding arguably more sensitive factors (the size and value factors) would produce a model with a comparable level of sensitivity. We consider our empirical analysis of equity beta shows that businesses in our comparator set generate a consistent pattern of empirical estimates that is robust across different sample periods and econometric techniques.[813] We have confidence in our proxy for the risk free rate, which would be the same if we were to apply the Fama-French model.

Partington did not agree with SFG's submission that all models are sensitive to different estimation periods and methodologies. He advised:[814]

> We do not agree with SFG however, that “this applies to all models”. We agree that estimated values may vary over data sets, the question is do they vary moderately or do they vary so much as to be considered unstable and/or unreliable? In this context we note that Henry (2008, 2009, 2014) tests for, and finds no evidence of, structural instability in the estimates of the equity beta in the SL-CAPM.

NERA submitted that the Fama-French model produces a less precise estimate than the Sharpe-Lintner CAPM, ‘because it requires beta estimates relative to, not one, but three factors’. However, there may be a trade-off between precision (low standard deviation) and bias — the Fama-French model should be considered given its relative

811 A sample of the most recent material includes: CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 1–58; NERA, *Memo: Revised estimates of the MRP*, November 2014, pp. 1–3; SFG, *the required return on equity for the benchmark efficient entity*, February 2015, pp. 17–36; SFG, *Beta and the Black CAPM*, February 2015, pp. 1–45; NERA, *Historical estimates of the MRP*, February 2015, pp. 1–51; SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015, pp. 25–44.

812 SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2, 11–14; Frontier Economics, *Key issues in estimating the return on equity for the benchmark efficient entity*, June 2015, p. 7.

813 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 49.

814 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 25. Partington reviewed submissions made after this report and concluded that they do not change his conclusions (see: Partington & Satchell, *Report to the AER: return on equity and comment on submissions in relation to JGN*, May 2015, p. 6).

lack of bias.[815] We accept that a more complex model may be preferred over a less complex model where it offers a better estimate. However, we do not consider the Fama-French model provides a better estimate than the Sharpe-Lintner CAPM. As noted above, we do not consider that the Fama-French model provides compelling evidence that a book-to-market bias exists in the Sharpe-Lintner CAPM.

SFG submitted the variation between Fama-French model estimates arises because the studies that produce them are of different quality. We should only consider estimates from the best studies.[816] Further, NERA previously submitted:[817]

> [t]his criticism is puzzling because tests of the null that an unconditional risk premium is constant through time typically lack power. In other words, uncovering evidence of instability in risk premiums is generally difficult. This is because realised risk premiums are noisy.

We do not consider there are clear objective grounds to distinguish the 'best' studies. McKenzie and Partington supported this view.[818] While SFG argued that one methodology to estimating the Fama-French model is superior to other methodologies, we disagree.[819] We consider there is no agreed best methodology. McKenzie and Partington supported our position by questioning what the objective criteria to determine the best studies are.[820]

B.3.2 Fama-French factors may not reflect ex ante priced risk

The Fama-French model estimates average returns in the cross-section. McKenzie and Partington made the important point that, "the FFM is used to estimate the average return in the cross section and the benchmark regulated network service provider is not average given its relatively low economic risk".[821]

We are not satisfied the Fama-French model is helpful for our regulatory task because:

- We consider that whether factors are priced in the cross-section is unresolved. SFG referred to a number of possible explanations for why the value factor could

815 NERA, *The Fama-French Three-Factor Model: A Report for the ENA*, October, 2013, p. 24; NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, pp. 99–103.

816 SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2; SFG, *The Fama-French model*, 13 May 2014, p. 24. SFG suggests that the AER should use an approach akin to that in Brailsford, Tim, Clive Gaunt and Michael O'Brien (2012a), 'Size and book-to-market factors in Australia', *Australian Journal of Management*, 37, pp. 261–81.

817 NERA, *The Fama–French Three–Factor Model A report for the ENA*, October 2013, p. 31.

818 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 18; Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 38.

819 SFG, *The Fama-French model*, 13 May 2014, p. 24.

820 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 18; Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 38.

821 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 18.

be genuinely priced in average returns in the cross section.[822] However, none of the possible reasons is commonly accepted.[823]

- Even if we accepted that the factors were priced in the cross-section, McKenzie and Partington question the appropriateness of applying average returns in the cross-section to the benchmark efficient entity. Even if factors are priced in the cross-section, this does not necessarily imply that the benchmark efficient entity requires compensation above the level provided for under the Sharpe-Lintner CAPM.

Service providers noted that our concern that the Fama-French model is not clearly estimating ex ante required returns is 'curious'.[824] Frontier added that the rationale for using the Fama-French model is no different to the rationale for using the Sharpe-Lintner CAPM or Black CAPM - that is, to explain the cross-section of stock returns, based on explanatory factors that have been observed to correlate with stock returns in the past. HoustonKemp also noted that the Fama-French model was developed to address mis-pricing on low-cap and value stocks.[825]

We note that service providers and their consultants' criterion for selecting an asset pricing model appears to be how well it forecasts subsequent realised returns using asset pricing tests.[826] However, Partington and Satchell advised that it is the

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[822] These include the risk of financial distress, exposure to changes in expected economic growth and asymmetric exposure to market conditions. See SFG, *The Fama–French model*, 13 May 2014, pp. 30–32.

[823] SFG observed that these three theories, 'is not an exhaustive list of specific theoretical explanations for the performance of the Fama-French model. It represents three prominent theories that have empirical support. In the two decades since the publication by Fama and French (1993) an exhaustive literature has been devoted to theoretical explanations for the explanatory power of SMB and HML'. See SFG, *The Fama–French model*, 13 May 2014, p. 32. McKenzie and Partington discussed this in *Report to the AER, Part A: Return on equity*, October 2014, pp. 15–19, where they referenced Lewellen, Nagel and Shanken's observation that, 'one gets the uneasy feeling that it seems a bit too easy to explain the size and B/M effects'. See Lewellen, Nagel and Shanken, ''A sceptical appraisal of asset pricing tests', *Journal of Financial Economics*, 2010, 96, p. 175.

[824] CitiPower, *Revised Regulatory Proposal 2016–2020*, January 2016, p. 294; ; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, p. 288; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 69; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 50; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 55–56 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 55; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp, 49–50; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, pp. 126–128.

[825] HoustonKemp, *The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks,* January 2016, p. 5.

[826] CitiPower, *Revised Regulatory Proposal 2016–2020*, January 2016, p. 286, 292; Powercor, *Revised regulatory proposal 2016–2020,* January 2016, pp. 280, 286; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp.57–60, 66–67; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 41–45, 50; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 46–50, 54–55 ;

equilibrium expected returns that we want to measure when determining the cost of capital.[827] They added that forecasting stock returns and determining equilibrium expected returns (asset pricing) are two different tasks.[828]

We also note that the results of asset pricing tests such as those by Kan, Robotti and Shanken depend upon the characteristics used in sorting stocks into portfolios when undertaking asset pricing tests.[829] Partington and Satchell noted that in multiple model comparisons, the Fama-French model is rejected in tests using portfolios sorted by size and beta.

B.4 Dividend growth model

Dividend growth models use forecasts of a business' dividends to derive the return on equity by making the assumption that the present value of these dividends is equal to the business' market value of equity. Dividend growth models may come in many different forms. Our preferred construction of the dividend growth model is set out in section D.3. Dividend growth models typically require forecasts of dividends for a defined future period, and a rate at which dividends are forecast to grow in the long-term after the forecast period has ended.

We consider the point estimates of the return on equity from dividend growth models are currently unsuitable for:

- estimating the return on equity for the benchmark efficient entity
- performing a cross check on whether other models (including the Sharpe-Lintner CAPM) are producing reasonable estimates of the return on equity.

Our reasons for this position are:

- There is insufficient data on dividend forecasts to form robust estimates of the required return on equity for Australian energy network service providers.[830] As such, there are practical difficulties in constructing credible datasets for

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JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 46–51, 54–55; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 41–50; APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 68–73.

[827] Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 40.

[828] Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 38. Partington and Satchell noted that , for example, adding a momentum factor to the Fama and French three factor (FF3) model improves the power of the model to forecast returns, but the regulated businesses while arguing for the FF3 model do not suggest that momentum determines the cost of capital for long term projects. Since momentum is short lived it is not appropriate as a determinant of equilibrium expected returns in the long term.

[829] Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 46–48.

[830] AER, *Explanatory Statement to the rate of return guideline (appendices)*, December 2013, p. 15.

implementing industry specific dividend growth models.[831] Also, there are too few Australian businesses to estimate dividend growth models on an individual business level.[832] However, a sufficiently robust data series exists for dividend yields for the Australian market as a whole.

- We do not consider that there is a sufficiently robust method for estimating the long-term dividend growth rate for Australian energy network service providers.[833] However, there are developed methods for estimating the long-term growth rate of dividends for the Australian market as a whole.[834]
- Dividend growth models can have limited robustness given they are highly sensitive to input assumptions regarding short and long-term dividend growth rates. This makes the models highly sensitive to potential errors in inputs. Further, dividend growth models may generate counter-intuitive results. For example, we have observed that, over extended periods of time, dividend growth models generated significantly higher average returns on equity for Australian energy network businesses than for the Australian market as a whole. We consider this fails a sanity test as the systematic risk of network businesses is likely less than the overall market.[835]
- Dividend growth model estimates may be upwardly biased due to:
    - The well-understood upwards bias in analyst forecasts.[836]
    - Slow-changing dividends, which is a well-understood phenomenon in financial theory and empirically supported by survey evidence.[837] There is likely to be an asymmetry in the effects because of a greater reluctance to cut dividends than increase dividends.[838]
    - The currently relatively low risk free rate. Lally observed that if dividend growth models do not incorporate a term structure, these will produce upwardly biased estimates when the risk free rate is low relative to its long term average, and expected to increase in a future period.[839]

[831] AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 77.

[832] AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 119.

[833] AER *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 15.

[834] For example, see: M. Lally, *The dividend growth model*, 4 March 2013; CEG, *Response to AER Vic gas draft decisions internal consistency of MRP and risk free rate*, November 2012; and CEG, *Update to March 2012 report: On consistency of the risk free rate and MRP in the CAPM*, November 2012.

[835] AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 120-122.

[836] McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, pp. 26, 31; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 46, 51; McKenzie and Partington, *The DGM*, December 2013, pp. 8–9. Also see Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 43.

[837] See, A. Brav, *Payout policy in the 21st century*, May 2005.

[838] McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, pp. 29–30; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 49–50.

[839] Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, pp. 11–12.

- Financing arrangements. Where there is significant financing of dividends and/or where substantial investment demand for funds is anticipated, there is a risk that dividend growth will slow or even turn negative for a period. This is likely to result in the model producing upwardly biased estimates.[840]

The first two concerns listed above are not relevant when using the dividend growth model to estimate the market risk premium. We therefore consider that dividend growth model estimates may be more useful for informing our estimate of the market risk premium. However, in doing so, we note that the other limitations set out above are likely to remain relevant. For these reasons, we place only limited reliance on dividend growth model estimates of market risk premium.

We note much of the material provided by service providers was considered in our April and June 2015 decisions and reviewed by McKenzie, Partington, and Satchell (Partington and Satchell maintained the positions set out by McKenzie and Partington).[841] Having reviewed all this material, McKenzie and Partington supported our decision to not use the dividend growth model to directly estimate the return on equity on the benchmark efficient entity. They also supported limiting the use of the dividend growth model to informing the estimate of the market risk premium.[842] However, they raised the concerns around the reliability of dividend growth model that we have outlined above.[843] While we use the dividend growth model to inform the estimate of the market risk premium, we also take these concerns into account.

Handley also reviewed submissions on the dividend growth model and stated that the model involves estimating an unobservable expected growth rate:[844]

> Notwithstanding the solid DCF [discounted cash flow] foundation upon which it is based, DGMs are not a panacea for the challenges associated with using an asset pricing model to estimate the return on equity. Arguably DGMs simply transfer the uncertainty and difficulties in estimating the parameters in an asset pricing model to uncertainty and difficulties in estimating the expected future dividend stream and in particular in estimating the expected growth rate in dividends

Handley showed that the return on equity estimated using a constant-growth version of the dividend growth model simply equalled the expected dividend yield next period plus

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840 McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, pp. 27–29; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 47–49.

841 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 26–40; Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 12; Partington & Satchell, *Report to the AER: return on equity and comment on submissions in relation to JGN*, May 2015, p. 6; Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations,* October 2015, p. 15.

842 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 39–40; Partington, *Report to the AER: Return on equity (updated), April 2015*, pp. 58–59.

843 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 26–36; Partington, *Report to the AER: Return on equity (updated), April 2015*, pp. 46–56.

844 Handley, *Advice on the return on equity*, 16 October 2014, pp. 13–14.

the growth rate.[845] Handley then stated that he considered it unclear whether the return on equity estimates from two and three stage models would be any more meaningful.[846]

Malko submitted that the wide acceptance of dividend growth models in the US demonstrates that this model is sufficiently robust to be useful in economic regulatory decision making.[847] However, we note Malko's admission that current corporate and academic practices are less supportive of the use of dividend growth models alone in estimating a rate of return and consider that other information should also inform the decision'.[848]

Service providers have not provided any substantively new evidence to alleviate our concerns that the dividend growth model cannot reliably estimate return on equity for individual firms or sectors.[849] Services providers have also not provided compelling evidence that dividend growth model estimates of market risk premium are not upwardly biased.

We consider that dividend growth models are likely to be biased in the current market, due to concerns about slow-changing dividend forecasts, bias in analysts' forecasts, and to the extent that there is a term structure for the return on equity. Our consultant, Partington and Satchell, also share our concerns on these issues.[850]

Our response to submissions on bias in the dividend growth model is set out in section D.4.

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845 Handley, *Advice on the return on equity*, 16 October 2014, p. 14.

846 Handley, *Advice on the return on equity*, 16 October 2014, p. 15.

847 Malko Energy Consulting, *Statement of Dr J. Robert Malko*, June 2015, pp. 4–5.

848 Malko Energy Consulting, *Statement of Dr J. Robert Malko*, June 2015, pp. 4–5.

849 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 286–298; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 280–292; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 64–72; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp. 47–52; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 52–58 ; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 52–58; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 39–40, 46–52; APTNT, *Amadeus Gas Pipeline access arrangement revision proposal*, August 2015, pp. 120–123.; Frontier Economics, The *required return on equity under a foundation model approach – Report prepared for Jemena Electricity Networks, ACTEWAGL Distribution, AusNet Services, Australian Gas Networks, CitiPower, Powercor and United Energy*, January 2016, pp. 17-20 & 28–31. Service providers instead submitted that our foundation model approach prevents us from having any real regard to the dividend growth model and to conclude erroneously that the Sharpe-Linter CAPM is the superior return on equity model and produces unbiased estimates. We respond to this submission in section A. Service providers also submitted that SFG's construction of the dividend growth model is robust, we assess SFG's model in section B.4.1.

850 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp. 27–28.

Service providers also supported SFG's construction of the dividend growth model and approach to using the model to estimate return on equity. [851] We consider that SFG's dividend growth model approach is unlikely to provide reliable estimates of the return on equity or market risk premium. Our concerns are detailed in section B.4.1 below.

B.4.1 SFG's construction of the dividend growth model

SFG and several service providers criticised our position in the Guideline and our April and June 2015 decisions to limit the role of the dividend growth model to informing the market risk premium, rather than also considering dividend growth model to inform the overall return on equity.[852] SFG submitted its construction of the dividend growth model could produce estimates that we could use for the Australian market as a whole, and at the industry level.[853] However, we consider SFG has overstated the ability of its dividend growth model to provide robust return on equity estimates at the industry level.

In SFG's 2014 analysis, there are 99 return on equity estimates using analyst forecasts for the network businesses over the period 2002 to 2014, based on a six month averaging period.[854] This is a small sample size, relative to the sample size for estimating the return on equity for the market as a whole. There are few analyst data because there are few network businesses listed on the Australian stock exchange. There is also limited analyst coverage of Australian network businesses. Given the relatively small sample of analyst forecasts available on Australian network businesses, we consider it is difficult to derive a sound return on equity estimate for these businesses using dividend growth models.

In SFG's 2015 report, it changed its approach to use a two month averaging period. In SFG's 2015 analysis, there are 235 return on equity estimates using analyst forecasts for the network businesses over the period 2002 to 2014.[855] This is a larger sample

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[851] Service providers submitted several SFG reports on this DGM construction. For the most recent report, see SFG, *Share prices, the DDM and the cost of equity for the market and a benchmark energy network*, February 2015.

[852] ActewAGL, *Access Arrangement Information for the 2016-21 ACT, Queanbeyan and Palerang Access Arrangement, Appendix 8.02: Return on equity-detailed proposal, Submission to the Australian Energy Regulator*, June 2015, p. 45–50; APTNT, *Amadeus Gas Pipeline: Access Arrangement Revision Proposal*, August 2015, p. 136–138; AGN, *2016/17 to 2020/21 Access Arrangement Information, Attachment 10.1: Rate of Return*, July 2015, p. 43–44; AusNet Services, *Regulatory proposal 2016-20*, 30 April 2015, p. 331–333; United Energy, *2016 to 2020 Regulatory Proposal,* April 2015, pp. 117–120; CitiPower, *Regulatory proposal 2016-2020*, April 2015, p. 221–224; Powercor, *Regulatory proposal 2016-2020*, April 2015, p. 229–232; Energex, *2015-20 revised regulatory proposal*, July 2015, p. 96–97 & 101–103; Ergon Energy, *Regulatory Proposal 2015-20 (revised), Appendix C: Rate of Return*, July 2015, p. 146–147; SAPN, *Revised Regulatory Proposal 2015-20*, July 2015, p. 368; Jemena Electricity Networks (Vic) Ltd, *2016-20 Electricity Distribution Price Review Regulatory Proposal, Attachment 9-2, Rate of return proposal,* April 2015, p. 81–85.

[853] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 2; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 30–33.

[854] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 58.

[855] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 30–31.

size than that used in its 2014 analysis. However, we consider it is still a small sample size relative to the sample size for estimating the return on equity for the market as a whole. We also maintain our above considerations on SFG's average risk premium ratio (or effective equity beta). Moreover, we consider SFG's new approach of using a two month averaging period may introduce errors because of a lack of data. For example, in SFG's sample, there are six two month periods where there were no analyst forecasts for energy network businesses.[856]

SFG estimates the return on equity for an energy network firm in a given two month period by averaging over all the return on equity estimates implied by all analyst forecasts for that firm over the two month period. If a particular analyst made more than one forecast for that firm in the two month period, then the use of a simple average means that analyst will be given more weight in the return on equity estimate compared to an analyst that makes only one forecast on that stock in a two month period. Further, firms that have more analyst coverage will have more two–monthly return on equity estimates and hence will receive more weight than firms that have less analyst coverage. Therefore, we consider that SFG's dividend growth model gives energy network firms with more analyst coverage greater weight.

We also note that SFG's approach does not entail directly estimating the return on equity for the using the dividend growth model. Rather, SFG applies its dividend growth model to produce a market risk premium estimate and a ratio of energy networks' risk premiums relative to the market risk premium (an indirect equity beta estimate). The method used to estimate the average risk premium ratio is not aligned with the definition of equity beta. The equity beta is the covariance between the return on the market and the return on a business divided by the variance of the market. We consider that, in doing so, SFG has overstated the ability of its dividend growth model to reliably estimate the return on equity directly. SFG is effectively using its dividend growth model to estimate the market risk premium to incorporate into a Sharpe-Lintner CAPM.

McKenzie and Partington also raised specific concerns about the simultaneous estimation approach applied by SFG for the service providers. They indicated that this application of a dividend growth model could generate virtually any return on equity estimate through model specification choices.[857]

SFG submitted its dividend growth model is more reliable and less volatile than our model.[858] However, this perception of stability is subjective and we do not agree with it. Figure 6 illustrates this point by showing three time series:[859]

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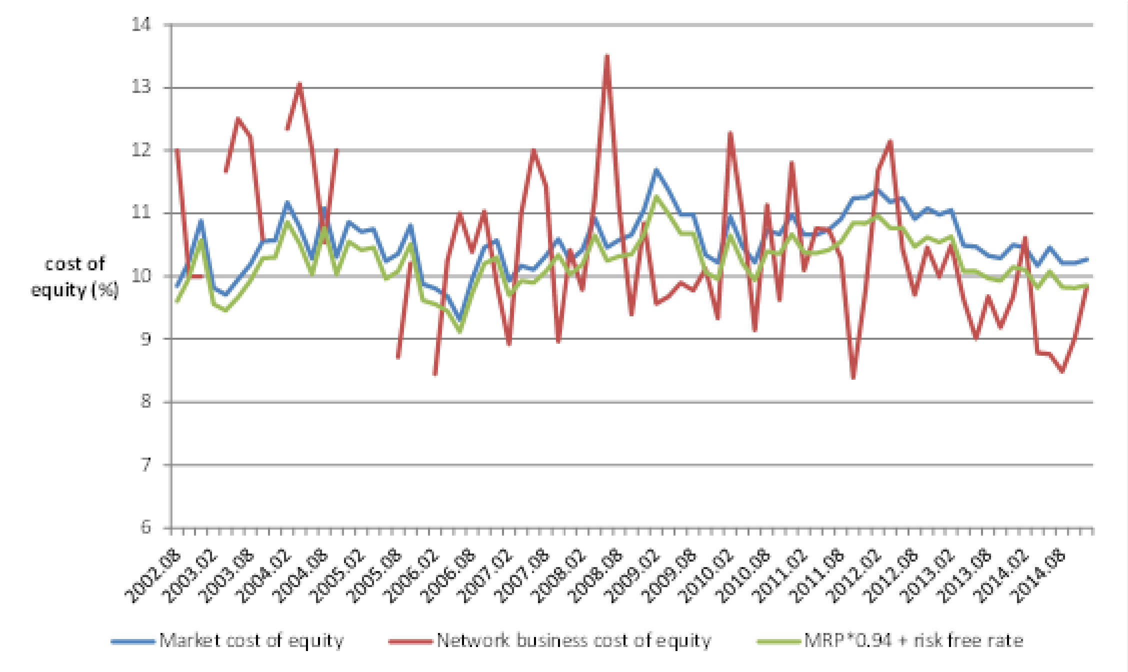
[856] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 40–41.

[857] McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 34–36; Partington, *Report to the AER: Return on equity (updated), April 2015*, pp. 53–56.

[858] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, pp. 48, 57, 65; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 24, 27, 31.

- the return on equity for the market determined by SFG's model (blue line)
- the return on equity for network businesses determined by multiplying the market risk premium from SFG's model by 0.94 then adding the prevailing risk free rate (green line)
- the return on equity for network businesses determined by directly applying SFG's model (red line).

Figure 6 Movements in SFG's dividend growth model



Source: SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 40–41; AER analysis.[860]

Note: SFG calls the market value return on equity, the 'cost of equity'. This is the concept we refer to throughout this decision as the 'return on equity'.

The gaps in the red line are the result of periods where there were no analyst forecasts for energy network businesses. Therefore, the return on equity for network businesses could not be estimated for these periods.

Figure 6 illustrates that direct estimates of the return on equity for network businesses using SFG's dividend growth model (red line) are volatile. Whereas, by construction,

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[859] This is based on SFG's 2015 analysis, which uses a two month averaging period. A similar chart based on SFG's 2014 analysis can be found in our November draft decisions. For example, see: AER, *Draft decision: ActewAGL distribution determination 2015–16 to 2018–19—Attachment 3: Rate of return*, November 2014, p. 231.

[860] We were unable were unable to replicate SFG's market risk premium, network risk premium and risk premium ratio series in Table 3 of its report because there appears to be an error in the risk free rate series presented by SFG. In Table 3 of SFG's report, the risk free rate series is identical to the market risk premium series. See: SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 40–41 (table 3). We also note that this figure does not contain any more recent data as SFG has not updated its dividend growth model since its February 2015 report.

SFG's indirect estimates of the return on equity for network businesses using a hybrid CAPM / dividend growth model are more stable (green line). SFG and service providers only proposed indirect estimates. SFG's indirect approach results in a return for the industry that precisely mirrors movements in the market. SFG's indirect approach is predisposed to this outcome because of its construction. It is not clear to us that this outcome is a reasonable reflection of expected returns for the industry.

B.5 Wright CAPM and historical CAPM

The Wright CAPM is an alternative implementation of the Sharpe-Lintner CAPM. This is where the return on the market portfolio and the risk free rate are estimated as separate components of the market risk premium. The following equation represents this relationship:

$$ke = rf + \beta e \times (rm - rf)$$

Where: ke is the expected return on equity

rf is the risk free rate

βe is the equity beta

rm is the expected return on the market

Typically, under the Wright approach the return on the market is estimated using historical data, while a prevailing risk free rate is estimated. Under an historical specification of the CAPM, both the return on the market (or market risk premium) and the risk free rate is estimated by reference to long-run historical data.[861]

In its access arrangement proposal, APTNT proposed a 'Wright' specification of the Sharpe-Lintner CAPM.[862] Many other service providers proposed using the underlying premise of the Wright CAPM – that the market return is relatively constant – when estimating market risk premium.[863]

861 For example, see: Ausgrid, *Regulatory proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p. 79.

862 APTNT, *Amadeus Gas Pipeline Access Arrangement Information Effective 1 July 2016 - 30 June 2021*, August 2015, p. 21. However, APTNT proposed a DGM-based MRP in its January 2016 revised proposal and argued that August 2015 proposal was not a Wright CAPM: APTNT, *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 75–77.

863 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 309–310; AER, *Preliminary decision: CitiPower determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, p. 507–510; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 303–304; AER, *Powercor Preliminary Decision - Attachment 3: Rate of Return*, October 2015, p. 507–508; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 82–83; AER, *Draft decision ActewAGL distribution determination 2016 to 2021: Attachment 3 – Rate of return*, November 2015, pp. 520–522; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, p. 61; AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, p. 510–512; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, p. 66; AER, *Draft decision Australian Gas Networks access arrangement 2016 to 2021–Attachment 3: rate of return*, November 2015, pp. 516–518; AER, *Draft decision Amadeus Gas Pipeline access arrangement 2016 to 2021: Attachment 3–Rate of return*, November 2015, pp. 519–522; See also: CEG, *WACC*

We consider the point estimates of the return on equity from these non-standard specifications of the Sharpe-Lintner CAPM are currently unsuitable for:

- estimating the return on equity for the benchmark efficient entity
- performing a cross check on whether other models (including the Sharpe-Lintner CAPM) are producing reasonable estimates of the return on equity.

Our reasons for this position are:

- The models are not theoretically justified. The Sharpe-Lintner CAPM is a forward-looking equilibrium asset pricing model and therefore requires forward looking input parameters.[864]
- The models do not take into account changing market conditions. Therefore, they are unlikely to (at a given point in time) estimate an unbiased forward-looking estimate of the required return on equity. Historical data may be used as a basis for estimates of the model's parameters where they are good evidence of forward-looking parameters. However, we do not consider using historically based estimates that are clearly not representative of the forward looking rate will result in an unbiased estimate of the return on equity.[865]
- We consider that no compelling empirical evidence is before us to support the use of the models. We do not agree with the underlying premise of the Wright CAPM that there is a clear inverse relationship between movements in the risk free rate and market risk premium. Frontier submitted that empirical evidence from Wright & Smithers indicates that the return on the market using U.S. data has been relatively stable over time.[866] However, applying Wright's approach to Australian data, Lally found the estimated market risk premium series is more stable than the average real market return series.[867]

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estimates: A report for NSW DNSPs, May 2014, pp. 6–10; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015; NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 81; Frontier, *Key issues in estimating the return on equity for the benchmark efficient entity*, June 2015, pp. 10, 28–32, 54–55; Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, p. 34.

864 Bringham and Daves state, 'The CAPM is an ex ante model, which means that all of the variables represent before-the-fact, expected values'. See Bringham and Daves, *Intermediate financial management*, Ed. 10, Cengage Learning, 2010, p. 53.

865 McKenzie and Partington advised 'the current market return on equity, as given by the CAPM, requires estimates of the current risk free rate and the current market risk premium. The current risk free rate is readily estimated as the current yield on CGS of appropriate maturity'. See McKenzie and Partington, *Review of the AER's overall approach to the risk free rate and MRP*, February 2013, p. 30.

866 Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016, pp. 13-14.

867 Lally found the standard deviation of average real market returns is 1.5 per cent. The standard deviation for the average real government bond yield is 1.4 per cent. For the estimate MRP time series, it is 0.9 per cent. These standard deviations imply the average real market return is considerably more volatile than that for the estimated MRP. Lally, *Review of the AER's methodology*, March 2013, pp.12-16.

- Market practitioners, academics or regulators do not generally accept these models.[868] For example, an analysis of 78 suitable independent valuation reports over May 2013 to January 2016 indicates there are no reports that appear to use the Wright CAPM.

Handley considered the Wright CAPM and stated:[869]

> It appears to be based on two main ideas. First, a claim that the standard approach is internally inconsistent as it purportedly uses a different estimate of the risk free rate for the purposes of estimating the MRP.[870] But this is not correct. As discussed above, the item being estimated under the standard approach and the item being substituted into (6) is the MRP. It is a single estimate of a single item. It is not an estimate of the expected return on the market and an estimate of the risk free rate. Second, Wright draws on previous work by Wright, Mason and Miles (2003) which in turn draws on work by Siegel (1998) to conclude that:
>
>> "regulators should work on the assumption that the real market cost of equity is constant … as a direct consequence, whatever assumption is made on the risk free rate, the implied equity premium must move point by point in the opposite direction.[871]
>
> The theoretical justification for such an assumption is far from clear whilst the empirical evidence that is presented is not compelling. More importantly, this is a proposition whose widespread use and acceptance is yet to be established. Until then (if at all), there is no compelling reason to move from the standard approach to estimation.

We note that Handley's comments appear equally applicable to the 'long term' Sharpe-Lintner CAPM specification proposed by a number of service providers.

While we have used a range from the Wright CAPM to inform the overall return on equity, we have placed little reliance on this information given our concerns outlined above.[872]

Service providers submitted that the Wright CAPM is relevant to the estimation of the market risk premium, rather than the overall return on equity.[873] We compare our

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868 For example, the Wright CAPM's main use appears to be for regulatory purposes in the UK. See Wright, *Review of risk free rate and cost of equity estimates: A comparison of UK approaches with the AER*, October 2012.

869 Handley, *Advice on the return on equity*, 16 October 2014, pp. 17–18.

870 CEG, *WACC Estimates: A report for NSW DNSPs*, May 2014, pp. 3–4.

871 Wright, S., 2012, *Review of risk free rate ad cost of equity estimates: A comparison of UK approaches with the AER*, 25 October 2012, pp. 2–3.

872 This is for the same reasons stated in the appendices to the Guideline's explanatory statement and in our subsequent decisions. AER, *Explanatory statement to the rate of return guideline (appendices)*, 17 December 2013, pp. 24–28; AER, *Final decision JGN Access arrangement 2015–20, Attachment 3*, June 2015, pp. 83–88, 284–289.

873 CitiPower, *Revised regulatory proposal 2016–2020*, January 2016, pp. 307, 309–310; Powercor, *Revised regulatory proposal 2016–2020*, January 2016, pp. 301, 303–304; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return,*

foundation model equity risk premium to the Wright CAPM equity risk premium. This provides for consideration of both market risk premium and equity beta estimates, as the equity risk premium is the product of both estimates. We do not consider the Wright CAPM when estimating market risk premium. We consider that doing so would be unnecessary, and may place too much weight on the Wright CAPM given our concerns with it as set out above.

Partington and Satchell advised that they are 'unconvinced by the Wright approach' for estimating the market risk premium and recommend that we give it little weight.[874] The noted that the Wright CAPM is has no 'well accepted theoretical support', 'does not seem to be much used, if at all, in practice' and 'runs contrary to the well accepted view that asset prices are inversely related to interest rates'.

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gamma and inflation, January 2016, pp. 82–83; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, p. 61; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 66; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 66–67; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp.59–60; APTNT stated that it did not make submissions about the Wright approach in its original October 2015 submission. However, we note that APTNT's explanation of its original proposal for estimating the MRP is effectively an implementation of a Wright CAPM, see: *Amadeus Gas Pipeline Access arrangement revised proposal: response to Draft Decision,* January 2016, pp. 65–68.

874 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 31.

C Historical stock returns

This appendix examines realised returns to Australian listed equity (stocks) as a proxy for the historical return on the portfolio of all equity in the market. We examine both total returns and excess returns. Excess returns are the realised returns[875] that stocks have earned in excess of the returns on government bonds with a ten-year term-to-maturity.

Our dataset and methodology is based on Brailsford, Handley, and Maheswaran (Brailsford et al).[876] A detailed discussion on data and methodology can be found in Brailsford et al, our Guideline, and attachment 3 to our preliminary decision for JEN.

In the remainder of this section we examine:

- Prevailing estimates for both excess returns and total returns
- The relative merits of arithmetic and geometric averages of historical returns
- The relative merits of the ASX's adjustment and NERA's adjustment to historical stock returns data

C.1 Prevailing estimates: excess returns

Table 3-27 sets out our estimates of historical excess returns, measured using both arithmetic and geometric averages, and estimated over different sample periods up until the 2015 calendar year end.[877] Arithmetic average measures range between 5.2 and 6.2 per cent and geometric average measures range between 3.5 and 4.8 per cent.

Table 3-27 Historical excess returns (per cent)

Sampling period	Arithmetic average	Geometric average
1883–2015	6.1	4.8
1937–2015	5.7	3.9
1958–2015	6.2	3.8
1980–2015	5.9	3.5

875 The Sharpe-Lintner CAPM is an equilibrium pricing model and hence the market risk premium parameter of the model should reflect the premium that investors require in a market in equilibrium. In this section, we examine returns that have been realised in practice, over periods in which the market may not have been in equilibrium. This data is used for practical reasons - the ex-ante required return of investors is not observable. We consider that realised returns remain a reliable indicator of investor expectations in market equilibrium.

876 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 76–77, 85–86.

877 We have traditionally taken historical excess returns as a calendar year-end estimate. For consistency, and given these change slowly throughout time, we maintain this convention.

1988–2015	5.2	3.6

Source: Handley, *An estimate of the historical equity risk premium for the period 1883 to 2011*, April 2012, p. 6. AER update for 2012–2015 market data.

Notes: Based on a theta of 0.6.

C.2 Prevailing estimates: total returns

Table 3-28 sets out our estimates of historical returns on the market portfolio. The nominal return ranges from 10.0 to 12.7. We use a range because the estimated return on the market will vary depending on the time period used.[878]

Table 3-28 Historical returns on the market portfolio (per cent)

Sampling period	Market return (real)	Market return (nominal)
1883–2015	8.6	11.3
1937–2015	7.3	10.0
1958–2015	8.9	11.6
1980–2015	9.9	12.7
1988–2015	9.3	12.0

Source: Handley, *An estimate of the historical equity risk premium for the period 1883 to 2011*, April 2012, p. 6. AER update for 2012–2015 market data.

Notes Historical market returns are estimated using arithmetic averages, assuming a theta value of 0.6, and assuming an inflation rate of 2.5 per cent. Nominal figures calculated by the AER using the Fisher equation: $1+i=(1+r)\times(1+\pi)$ where r denotes the real return, i denotes the nominal return and π denotes the inflation rate.

We estimate a return on equity under the Wright CAPM[879] by combining the historical nominal market return with our prevailing risk free rate estimate[880] and equity beta estimates.[881] As shown in Table 3-29, our estimated range for equity beta and market return results in Wright CAPM return on equity estimates ranging from 5.8 to 9.8.

[878] AER, *Explanatory statement: Rate of return guideline (appendices)*, December 2013, pp. 26–27.

[879] See section B.5 for details on the Wright CAPM.

[880] Our risk free rate estimate is 2.94 per cent.

[881] Our estimated range for equity beta is 0.4 to 0.7. For more detail, see section 3.4.1.

Table 3-29 Wright CAPM return on equity (per cent)

AER equity beta estimate	Wright CAPM return on equity based on 10.0 market return	Wright CAPM return on equity based on 12.7 market return
0.4	5.8	6.8
0.7	7.9	9.8

Source: AER analysis.

Notes: Based on a risk free rate estimate of 2.93 per cent.

C.3 Arithmetic and geometric averages

Historical excess market returns are sensitive to the method of averaging returns over multiple periods. The arithmetic average return is the simple average annual return. The geometric average return is the average compounded annual return.[882]

In estimating the market risk premium, we have regard to both arithmetic and geometric average historical excess returns. We set out our reasoning in our final decision for Jemena Gas Networks (JGN), and this material remains relevant.[883] We also note that Partington and Satchell support our position to have regard to both types of average historical excess returns.[884] Overall, our decision is informed by the following considerations:

- We consider the arithmetic average of 10-yearly historical excess returns could be an unbiased estimator of a forward looking 10 year return. However, to obtain a sufficiently large dataset, historical excess returns are estimated as the arithmetic or geometric average of annual returns. Since annual historical excess returns are variable, their arithmetic average will overstate the arithmetic average of 10 year historical excess returns. Similarly, the geometric average of annual historical excess returns will understate the arithmetic average of 10 year historical excess returns.[885]
- We have previously considered arithmetic and geometric averages relevant when estimating a 10 year forward looking market risk premium using historical annual excess returns.[886] The Tribunal found no error with this approach.[887]

882 The arithmetic average is measured as the sum of N numbers divided by N. The geometric average is measured as the Nth root of the product of N numbers.

883 AER, *Jemena Gas Networks final decision 2015-20: Attachment 3—Rate of return*, June 2015, pp.333–338.

884 Partington and Satchell, *Report to the AER: Cost of equity issues–Final decisions for the VIC DNSPs*, April 2016, pp. 51–52.

885 For an additional example, see AER, *Draft decision: SPI Networks access arrangement*, September 2012, Appendix B.2.1.

886 For example, see AER, *Final decision: SPI Networks (Gas) access arrangemen*t, March 2013, Part 3, B.5.1.

887 Australian Competition Tribunal, *Application by Envestra Ltd (No 2) [2012] ACompT4*, 11 January 2012, paragraph 157. Also see, Australian Competition Tribunal, *Application by Public interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016.

- In their recent review for the Office of Gas and Electricity Markets (Ofgem), Wright and Smithers advocated using geometric average returns, adjusted for return volatility on the arithmetic average. Wright and Smithers based their reasoning on the distortions introduced by direct arithmetic averaging.[888] While we do not adopt this approach, this indicates that experts and other regulators consider geometric averages valuable.
- McKenzie, Partington, and Satchell recommended the consideration of both arithmetic and geometric averages, tempered by an understanding of their inherent biases.[889]

In a series of reports, NERA recommended we give no weight to geometric average historical excess returns.[890] In June 2015, NERA submitted a further report on this issue.[891] In January 2016, HoustonKemp submitted a similar report to NERA that also recommended that no weight be given to geometric average historical excess returns.[892]

We consider NERA and HoustonKemp's submissions take a narrow view of the issue. As Partington and Satchell stated in their October 2015 report:[893]

> NERA (2015, History) makes a repeated case that if we are estimating the mean for one period using data over a number of past periods (denoted by T) then they are unaware of any work that suggests the superiority of geometric returns or combinations of geometric or arithmetic returns in situations when the data are iid or correlated. We see no compelling reason why the situation described above is the only one that the AER should consider.

There remains uncertainty over whether an arithmetic or geometric average (or some combination of the two) of historical excess returns provides a better estimate of expected excess returns. The answer to NERA's concern whether geometric or arithmetic averages are better is unclear and not settled amongst academics. Both methods have limitations. This is well summarised by Partington and Satchell:[894]

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888 Wright and Smithers, *The cost of equity capital for regulated companies: A review of Ofgem*, 2014, p. 9.

889 McKenzie and Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, p. 5; Partington and Satchell, *Report to the AER: Return on equity and comment on submissions in relation to JGN*, May 2015, pp. 16–17; Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, pp. 44–45.

890 See, for example: NERA, *Prevailing conditions and the market risk premium: A report for APA Group, Envestra, MultiNet and SP AusNet*, March 2012, pp. 3–16; NERA, *The market, size and value premiums: A report for the Energy Networks Association*, June 2013, pp. 25–30 (NERA, *The market, size and value premiums*, June 2013); NERA, *Historical estimates of the market risk premium*, February 2015, pp. 12–24.

891 NERA, *Further assessment of the historical MRP: Response to the AER's final decisions for the NSW and ACT electricity distributors*, June 2015, pp. 14–28.

892 HoustonKemp, *The Cost of Equity: Response to the AER's Draft Decisions for the Victorian Electricity Distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, pp. 33-38.

893 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 44.

894 Partington and Satchell, *Report to the AER: Return on equity and comment on submissions in relation to JGN*, May 2015, p. 17.

> So which of these estimates is a better measure of expected returns? Jacquier, Kane and Marcus (2003) claim that academics tend to use the arithmetic return and that practitioners tend to use the geometric return. A more rigorous answer is that the choice depends upon what is assumed to be the distribution of returns through time. Assuming returns over time follow independent identical distributions with a finite variance, then it is widely accepted that the arithmetic average is the appropriate estimator of expected returns. Otherwise, the geometric average has a role to play. It has long been well understood that returns do not conform to the assumption of independent identical distributions, see for example Akgiray (1989). The literature has therefore suggested a weighted sum of the arithmetic and geometric averages be used in estimating the expected return. Unfortunately, there is no generally accepted optimal weighting scheme. In our opinion the use of arithmetic averages alone is likely to result in an upward biased estimate of expected returns and the use of geometric averages alone is likely to result in a downward biased estimate.

In their 2012 report, McKenzie and Partington provided numerous references to academic studies that support this view.[895] They also considered that unbiasedness is only one desirable property of an estimator. Another consideration is efficiency, and 'the question then becomes one of trading off bias and efficiency'.[896] We agree with this view.

Moreover, in their October 2015 report, Partington and Satchell demonstrate that, even in the restricted case that NERA presents, the geometric average can be a superior estimator.[897]

HoustonKemp submitted that Partington and Satchell, in their October 2015 report, made an incorrect claim that if the gross return to an asset is lognormally and independently and identically distributed through time, then the arithmetic mean of a sample of gross returns to the asset will provide an upwardly biased estimator of the expected gross return to the asset over a single period while the geometric mean will, for a large gross return, provide an unbiased estimator.[898]

We consider that HoustonKemp's 2016 report has incorrectly considered Partington and Satchell's results on geometric and arithmetic mean returns. This is well summarised by Partington and Satchell:[899]

> "We are interested in the term $\exp(\mu) - 1$; which we call the implied arithmetic rate of return. If we knew that the true geometric rate of return is μ then the true

[895] See McKenzie and Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, pp. 5–9.

[896] See McKenzie and Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, p. 8.

[897] Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, pp. 44–45.

[898] HoustonKemp, *The Cost of Equity: Response to the AER's Draft Decisions for the Victorian Electricity Distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, pp. 35.

[899] Partington and Satchell, *Report to the AER: Cost of equity issues–Final decisions for the VIC DNSPs*, April 2016, pp. 51–52.

arithmetic rate of return is $\exp(\mu)-1$. This is a property of the parameters of our model and, as yet, involves no notion of expectations of estimators, contrary to any assertions by HoustonKemp. We then consider the extent to which estimators, based on the arithmetic mean and the geometric mean over or under estimate $\exp(\mu)-1$. We showed that the expected value of the arithmetic mean is $\exp(\mu+\frac{1}{2}\sigma^2)-1$; independent of the sample size so it is always biased upwards relative to $\exp(\mu)-1$. We also show that the expected value of the geometric mean= $\exp(\mu+\frac{1}{2T}\sigma^2)-1$, where T is the size of the sample. This is biased upwards relative to $\exp(\mu)-1$; but the bias disappears as T gets large. HoustonKemp arrive at the same formula, see equation (23), page 36, but then wrongly assume that the parameter function of interest is $\exp(\mu+\frac{1}{2}\sigma^2)$. The report then asserts that the bias, relative to the wrongly assumed parameter $\exp(\mu+\frac{1}{2}\sigma^2)$, is increasing in T. The HoustonKemp analysis is simply irrelevant."

NERA has questioned the relevance of the Akgiray (1989) and the Jacquier, Kane and Marcus (2003) articles referenced by Partington and Satchell.[900] It considered these articles do not match how we use historical excess returns data. We consider it is the key messages of the articles that are relevant to our analysis and these are more broadly applicable than NERA suggests. If the key messages of an academic article were only relevant to those undertaking precisely the same task, their usefulness would be exceedingly limited. For example, Akgiray's use of daily stock returns does not necessarily limit the relevance of his key message about the temporal behaviour of stock returns.

SFG and Frontier Economics have also recommended we give no weight to geometric average historical excess returns.[901] This is a reiteration of its views from previous reports, and is based primarily on SFG's submission that arithmetic averages are more representative of future expectations.[902] We have responded to SFG's views in previous decisions and this material remains relevant.[903]

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900 NERA, *Further assessment of the historical MRP: Response to the AER's final decisions for the NSW and ACT electricity distributors*, June 2015, pp. 19–20.

901 See SFG, *The required return on equity for the benchmark efficient entity*, February 2015, p. 23; Frontier, *Key issues in estimating the return on equity for the benchmark efficient entity: Report prepared for ActewAGL Distribution, AGN, AusNet Services, CitiPower, Ergon, Energex, Jemena Electricity Networks, Powercor, SA Power Networks, and United Energy*, June 2015, p. 62.

902 SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 44–49.

903 See, for example: AER, *Access arrangement draft decision: Multinet Gas (DB No. 1) Pty Ltd Multinet Gas (DB No. 2) Pty Ltd 2013–17—Part 3 appendices*, September 2012, appendix B section B.2.1; AER, *Access arrangement final decision: Multinet Gas (DB No. 1) Pty Ltd Multinet Gas (DB No. 2) Pty Ltd 2013–17—Part 3 appendices*, September 2012, appendix B section B.5.1; AER, *Access arrangement draft decision: Roma to Brisbane Pipeline 2012–13 to 2016–17*, April 2012, appendix C section C.1.1; AER, *Access arrangement final decision: Roma to Brisbane Pipeline 2012–13 to 2016–17*, August 2012, appendix B section B.2.1; AER, *Jemena Gas Networks final decision 2015-20: Attachment 3—Rate of return*, June 2015, pp.333–338.

Ultimately, we consider there are strengths and weaknesses associated with using arithmetic or geometric averages of historical excess returns to estimate the 10 year forward looking (or expected) market risk premium. We are not satisfied that NERA, HoustonKemp, SFG, or Frontier have provided sufficient evidence to support the conclusion that using arithmetic averages of historical excess returns provides a 'materially better estimate' of the market risk premium than an estimate based (solely or in part) on geometric averages.[904] We agree with Partington and Satchell's conclusion (a reiteration of McKenzie and Partington's 2012 conclusion) that:[905]

> The widespread current practice is to use unadjusted geometric and arithmetic averages. Given the current state of knowledge, we see no strong case to depart from this common practice and recommend the use of both of these metrics, tempered by an understanding of their inherent biases.

C.4 ASX adjustment to historical data

Our analysis of historical stock returns has to date used data and methods developed by Brailsford et al. and updated from time to time by Handley and the AER.[906] The data used by Brailsford et al. was provided to them by the ASX.[907] Service providers submitted that the data set from Brailsford et al. could be improved upon by substituting an adjustment made by the ASX and embedded in the data with an alternate adjustment proposed by NERA.[908]

This issue has been raised numerous times since our Guideline development process,[909] and this history is set out in our preliminary decision.[910]

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904 NERA, *Historical estimates of the market risk premium*, February 2015, p. 12. Also see NERA, *Further assessment of the historical MRP: Response to the AER's final decisions for the NSW and ACT electricity distributors*, June 2015, p. 14.

905 Partington and Satchell, *Report to the AER: Return on equity and comment on submissions in relation to JGN*, May 2015, p. 17.

906 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 73–97; J. Handley, *An estimate of the historical equity risk premium for the period 1883 to 2011*, April 2012. (Handley, *Historical equity risk premium to 2011*, April 2012).

907 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 79–81.

908 NERA, *The market risk premium, analysis in response to the AER's draft rate of return guideline: A report for the Energy Networks Association*, 11 October 2013. (NERA, *Market risk premium for the ENA*, October 2013); NERA, *The market size and value premiums*, June 2013. This alternative adjustment was supported by SFG in its 2014 and 2015 reports for several service providers (see SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 49–50; SFG, *The required return on equity for the benchmark efficient entity*, February 2015, pp. 49–52).

909 NERA, *The market risk premium, analysis in response to the AER's draft rate of return guideline: A report for the Energy Networks Association*, 11 October 2013; NERA, *The market size and value premiums*, June 2013; NERA, *Historical estimates of the market risk premium*, February 2015, pp. i–vii ; NERA, *Further assessment of the historical Market Risk Premium: Response to the AER's final decisions for the NSW and ACT electricity distributors*, June 2015, pp. 5, 8, 10. NERA's alternative adjustment was supported by SFG in its 2014 and 2015 reports for several service providers, see: SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 49–50; SFG, *The required return on equity for the benchmark efficient entity*, February 2015, pp. 49–52.

Firstly, our consideration of different time (or sampling) periods, and averaging methods, in estimating the market risk premium from historical excess returns reduces the materiality of NERA's submission.[911] Table 3-30 shows NERA's adjustment would only affect one of these time periods. When implemented, NERA's adjustment does not materially alter the estimates obtained from the full suite of estimation techniques.

Table 3-30 Historical excess returns using NERA's adjustment (per cent)

Sampling period	Excess returns with ASX adjustment	Excess returns with NERA adjustment
1883–2015	6.1	6.5
1937–2015	5.7	5.7
1958–2015	6.2	6.2
1980–2015	5.9	5.9
1988–2015	5.2	5.2

Source: AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, p. 83; AER updates

Notes: Based on arithmetic averages of historical stock returns, and a theta value of 0.6.

Secondly, we consider that NERA's proposed adjustment is not warranted and it is not clear that it would lead to a material improvement in the quality of our data. As Handley stated:[912]

> There are two main problems with the NERA analysis. First, it is unreasonable to draw a conclusion about three-hundred data points from a sample of only seven of those data points. Second and more fundamentally, NERA has not reconciled their data back to the Lamberton [ASX] data as illustrated below

In their published study, Brailsford et al. found that data for the period 1882 to 1964 originally represented the unweighted average yield rather than a weighted average yield, and reflected the average yield on dividend-paying stocks only rather than all stocks.[913] Brailsford et al. extensively considered issues concerning the data, and found that the ASX had made an adjustment to account for these data issues.[914] Brailsford et al. concluded that the ASX's adjustment was reasonable after considering:

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910 AER, *Preliminary decision Jemena determination 2016 to 2020: Attachment 3 - Rate of return*, October 2015, pp. 378 - 383.

911 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 83–84.

912 Handley, *Further advice on the return on equity*, April 2015, p. 8. Houston Kemp notes that NERA's analysis is based on a sample of nine, rather than seven, data points. This does not alter Handley's argument.

913 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 79–81.

914 Email correspondence from the ASX to Brailsford et al. dated 26 May 2004, reported in Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 80-81.

- the views of the stock exchange itself (a credible source), as its staff determined and applied the adjustment factor to the dividend yield series
- US studies, which have attempted to formulate dividend yield series over roughly comparable time periods
- estimates of unweighted and weighted dividend yields for the UK stock market over the period 1872 to 1913
- a more direct test by estimating the weighted dividend yield across all stocks listed on the Sydney Stock Exchange for February 1966 (the first month of decimal currency)

We consider that NERA's submission that its adjustment is more accurate because it uses more than one data point is misinforming.[915] Brailsford et al. uses one data point as one method (of several) to check the reasonableness of the ASX adjustment. This does not mean the ASX adjustment itself is based on one data point. Handley responded to this misconception multiple times. For example:

- In his October 2014 report, Handley stated:[916]

> Before addressing NERA's analysis, it is appropriate to clarify a very important misconception concerning the adjustment. Contrary to the claim by SFG – and it is not clear whether this view is also shared by NERA – the adjustment was not something which BHM took upon themselves to apply to the Lamberton data. Rather, the data that the ASX provided to BHM had already had been adjusted by the ASX. In other words, the ASX had many years earlier decided in their knowledge and wisdom that some adjustment was necessary and it was the ASX who determined the amount and adjusted the data accordingly. BHM simply sought to confirm their understanding of the data series provided by the ASX by reconciling it back to original sources.

- In his May 2015 report, Handley stated:[917]

> The inference in the first statement that the stock and dividend data underlying the Brailsford, Handley and Maheswaran (2008) – BHM – dataset is not genuine is incorrect and troubling. The claim (by NERA) in the second statement that BHM, rather than the ASX, made the adjustment to the dividend data is incorrect.

HoustonKemp raise again the issues that no ASX publication uses the ASX adjustment and that the ASX has stated that it has no opinion on the adjustment. We remain satisfied that the adjustment originated with the ASX, irrespective of the existence of any ASX publication using the data, and that ASX provided the adjusted data to Brailsford et al.

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915 See NERA, *Historical estimates of the market risk premium*, February 2015, p. vi.

916 Handley, *Advice on the return on equity*, October 2014, p. 19

917 Handley, *Advice on the rate of return for the 2015 AER energy network determination for Jemena Gas Networks*, May 2015, p. 27.

We also consider that NERA has not established that the overall level of its adjustment is superior to the ASX adjustment. In addition to examining the ASX adjustment to account for simple, unweighted yields, Brailsford et al. examined other concerns over data quality and the imprecision of the underlying series',[918] specifically:[919]

- employing hindsight in sample selection commonly imparts an upward (survivorship) bias
- the Commercial and Industrial price index from 1875 to 1936 does not include the financial sector and, therefore, is not strictly comparable to the All Ordinary Shares price index that followed from 1936 to 1957
- the Commercial and Industrial price index from 1875 to 1936 suffers from narrow coverage—there are only five stocks in the index in 1875, 12 in 1905 and 47 in 1935
- Australian government stock price controls were in operation from November 1941 to February 1947 and, therefore, prices over this period were not fully market determined
- each of Lamberton's (1958) industry indices are value-weighted, but in forming the All Ordinary Shares index and the All Ordinary Shares (excluding Financial) index, the relevant component industry indices have been weighted according to their aggregate amount of paid up capital..

Brailsford et al. subsequently considered that:[920]

> Although it is difficult to draw a conclusion on the extent to which the above issues impact on the observed rates of return on the equity index relative to the unobserved 'true' rates of return, a consequent bias leading to an overstatement of equity performance up to the mid-1950s is probable.

Given this probability of overstatement considered by Brailsford et al., it is not clear that a smaller downward adjustment to the original data would reduce bias.

[918] Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 75.

[919] Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 76–77.

[920] Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 77.

D AER's dividend growth model

Dividend growth models use forecast dividends of businesses to derive the return on equity by assuming that the present value of these dividends is equal to the business' market value of equity.[921] Consistent with the rate of return guideline (Guideline), we use dividend growth models to inform our estimate of the market risk premium.[922] However, we consider that limited reliance should be placed on estimates from dividend growth models.

In this appendix we set out:

- Prevailing estimates of the market risk premium using our preferred construction of the dividend growth model.
- Sensitivity analysis surrounding our prevailing estimates.
- Our preferred construction of the dividend growth model.
- Limitations with the use of dividend growth models due to potential upward bias.

D.1 Prevailing estimates

Results in Table 3-31 show that, for the two month period up to end–December 2015, the dividend growth models produce a range of market risk premium estimates between 7.57 to 8.84 per cent.

Table 3-31 Market risk premium estimates under dividend growth models (per cent)

Growth rate	Two stage model	Three stage model
3.8	7.57	7.90
4.6	8.36	8.41
5.1	8.84	8.80

Source: Bloomberg, AER analysis.

Notes: Growth rate is nominal, for more detail on derivation of these long term dividend growth rate estimates see section B.2.1 of Attachment 3 to our preliminary decision for JEN. Market risk premium estimates are based on an assumed theta of 0.6, and a 2 month average (Nov-Dec 2015) of analysts' dividend forecasts.

[921] For clarity, we use the term 'return on equity' in regards to market value. This is consistent with the rest of our decision, and the use of terminology in the rules. In its report on the DGM, SFG uses 'return on equity' in regards to book value and uses the term, 'cost of equity' with regards to market value.

[922] AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 84.

D.2 Sensitivity analysis

We consider that market risk premium estimates from dividend growth models are very sensitive to input assumptions such as the:

- Long term dividend growth rate.
- Period estimates are averaged over.
- Use of analyst forecasts, which are likely to be biased.

These issues are further discussed in section D.4. In the remainder of this section, we show how sensitive our dividend growth model is to these factors. This is summarised in Table 3-32.

Table 3-32 Sensitivities in the dividend growth model (per cent)

Sensitivity	Two stage model	Three stage model
Baseline 4.6% long-term growth rate 2 month average to end December 2015 unadjusted analysts' forecasts	8.36	8.41
5.1% long-term growth rate	8.84	8.80
3.78% long-term growth rate	7.57	7.90
6 months to end December 2015	8.37	8.38
12 months to end December 2015	8.07	8.17
Analysts' forecast + 10%	9.05	9.10
Analysts' forecast - 10%	7.68	7.73
Combined - low	6.68	6.88
Combined - high	9.53	9.48

Source: Bloomberg, AER analysis.

Notes: All market risk premium estimates are based on an assumed theta of 0.6.
Combined - low is based on 3.78% growth, 12 month averaging, analysts' forecasts - 10%.
Combined - high is based on 5.1% growth, 2 month averaging, analysts' forecasts + 10%.

Long-term dividend growth rate

We have used our point estimate growth rate (4.6 per cent) as a baseline. This is based on the mid-point of Dr Martin Lally's (Lally's) estimates.[923] While the top of Lally's range is 5.1 per cent, McKenzie and Partington have advised that a long term

[923] Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, p. 14.

dividend growth rate of 4.6 per cent is on the high side.[924] McKenzie and Partington considered that the long term dividend growth rate should be 3.73 per cent—or 3.78 per cent, excluding the most extreme values.[925]

We have not changed our approach set out in the Guideline. We do not adopt a lower long term dividend growth rate.

Averaging period

We have based our dividend growth model estimate on data over the November and December 2015 period. Our approach is consistent with the Guideline method. We do not average over several years because this would reduce the tracking ability of our dividend growth model.

As seen in Table 3-32, we use a two month averaging period as a baseline. We also consider a six month averaging period, which is consistent with SFG's dividend growth model.[926] Having regard to McKenzie and Partington's advice, we also consider a 12 month averaging period.[927]

Biases in analyst forecasts

McKenzie and Partington advised that dividend growth models are often biased upwards because analysts tend to overestimate dividends in their forecasts.[928] To demonstrate the potential impact, we have adjusted forecast dividends per share by 10 per cent downwards and upwards.

D.3 Preferred construction of the dividend growth model

Our preferred construction of the dividend growth model is consistent with that set out in the Guideline.[929] The following equation depicts this dividend growth, which we apply to estimate k, the expected return on equity for the market portfolio:

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924 McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, p. 34; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 53; McKenzie and Partington, *The DGM*, December 2013, p. 24.

925 The extreme values include the Lally/Barra growth estimate of 0.31% and the CEG estimate of 6.5%. See: McKenzie and Partington, *The DGM*, December 2013, p. 15. Note McKenzie and Partington call the market value return on equity, the 'cost of equity'.

926 As applied in its 2014 report. SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014.

927 McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014.

928 McKenzie and Partington, *Report to the AER: The DGM*, 14 December 2013, pp. 8–9; McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 26, Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 46.

929 See: AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 114–125 for more information on our preferred DGM construction. Note that since publishing our Guideline we have been informed by Bloomberg that its convention for reporting dividend forecasts on an index is to use calendar year forecasts as the relevant financial year forecasts.

$$P_c = \frac{m \times E(D_c)}{(1+k)^{m/2}} + \sum_{t=1}^{N} \frac{E(D_t)}{(1+k)^{m+t-0.5}} + \frac{\frac{E(D_N)(1+g)}{k-g}}{(1+k)^{m+N-0.5}}$$

Where: Pc is the current price of equity, for which we use the S&P/ASX 200 index as the proxy

E(Dc) is expected dividends per share for the current financial year[930]

E(Dt) is expected dividends per share for the financial year t years after the current financial year

m is the fraction of the current financial year remaining, expressed as a decimal point

N is the time period after which dividend growth reverts to its long-term rate (for the two stage model, N = 2, for the three stage model N = 9)

g is the expected long term growth rate in nominal dividends per share. For this parameter, we use a range of 4.0 to 5.1 per cent, with a point estimate of 4.6 per cent.

We adopt two versions of a simple standard dividend growth model:

- A two stage model, which assumes that dividends grow at the long term growth rate following the dividend forecast period.
- A three stage model, which assumes that dividend growth transitions linearly over eight years from the short term growth rate implied in the dividend forecast period to the long term growth rate.

Our dividend growth models also display the following characteristics:

- They use daily data of analysts' consensus dividend forecasts for the ASX 200 index from the Bloomberg Professional Services (Bloomberg). Analyst' dividend forecasts are for the current and following two financial years. We take monthly averages the daily data.
- They use market prices for the ASX 200[931].
- They estimate a long term growth rate in dividends per share. We determine this by adjusting the long term growth rate in real gross domestic product (GDP) for the net creation of shares and expected inflation.[932]

We consider our preferred construction of the dividend growth model to be reasonable. We developed our preferred construction of the model in close consultation with stakeholders when developing the Guideline.[933] We have analysed a variety of submissions on our construction of the model,[934] which have not persuaded us to

930 We sourced dividend forecasts from Bloomberg. We have been informed by Bloomberg that its convention for reporting dividend forecasts on an index is to use calendar year forecasts as the relevant financial year forecasts.

931 Rather than target prices.

932 Assumed to be 2.5 per cent, which is the mid-point of the RBA's target inflation band.

933 For example, see AER, *Explanatory statement to the draft rate of return guideline*, August 2013, pp. 219–225; AER, *Consultation paper: Rate of return guidelines*, May 2013, pp. 101–102.

934 Specifically, see SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013; SFG, *Reconciliation of dividend discount model estimate with those compiled by the AER*, 10 October 2013; SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015.

depart.[935] Further, experts have critically reviewed[936] our construction of the dividend growth model and consider that, overall, this advice suggests our model construction is reasonable.[937] We also have sound reasons for adopting the technical specifications of our preferred construction of the model. A detailed discussion of the reasons for our preferred construction of the dividend growth model can be found in Appendix B to Attachment 3 of JEN's preliminary decision.

We note that JEN uses the AER's construction of the dividend growth model[938] in its multi-model approach to estimating its proposed market risk premium.[939] Service providers have in the past proposed the use of SFG's dividend growth model.

D.4 Sources of potential upward bias

Evidence we have reviewed indicates that the market risk premium estimates from dividend growth models are very sensitive to input assumptions and likely to show an upward bias in current market conditions.[940] While we still propose to use our construction of the dividend growth model to inform our market risk premium estimate, we consider it important to have regard to the existence of this potential bias. We discuss below the factors that we have considered.

Slow-changing dividends

Dividends are a smoothed version of both free cash flow to equity and profits.[941] Slow-changing (or 'sticky') dividends are a well-understood phenomenon in financial theory and empirically supported by survey evidence, which suggests that companies are reluctant to cut dividends and increase dividends only when maintainable high earnings per share are expected.[942] McKenzie and Partington consider that there is

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935 Note that since publishing our Guideline we have been informed by Bloomberg that its convention for reporting dividend forecasts on an index is to use calendar year forecasts as the relevant financial year forecasts.

936 McKenzie and Partington, *Report to the AER: The Dividend Growth Model (DGM)*, December 2013; Lally, *Review of the AER's Proposed Dividend Growth Model*, December 2013.

937 For example, McKenzie and Partington found our 'implementation of a two stage model is a reasonable, transparent and easily reproducible' and recommended consider a transition to long term growth (which we subsequently adopted). See McKenzie and Partington, *The DGM*, December 2013, p. 24.

938 Although they use a different value for the assumed utilisation rate of imputation credits.

939 Jemena adopts the market risk premium estimates of Frontier Economics, see: Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, p. 37; Jemena, Revised proposal, 6 January 2016, p. 69.

940 Lally, *The DGM*, 4 March 2013; McKenzie and Partington, *The DGM*, December 2013, pp. 4–5; McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, pp. 26–30; Partington, Report to the AER: Return on equity (Updated), April 2015, pp. 46–50.

941 Which is the share of the operating cash flow available for owners. See: McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, p. 27; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 47. Also see Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 43.

942 See, A. Brav, *Payout policy in the 21st century*, May 2005.

likely to be an asymmetry in the effects because of a greater reluctance to cut dividends than increase dividends.[943]

If investors revise downwards their earnings expectations for a firm, the share price may drop significantly with the 'sticky' dividend unchanging. Together, this will cause a higher dividend yield, giving an upwardly-biased estimate of the return on equity. The reverse occurs if expectations are for profits and free cash flow to equity to rise.

Frontier submitted that this theoretical possibility is not material in current circumstances. Frontier submitted that:[944]

> An examination of the top 20 firms (which collectively account for approximately half of the total ASX market capitalisation) indicates that analysts are anticipating increasing dividends and earnings. The market capitalisation weighted average increase in forecasted earnings per share from 2015 to 2017 is 19%.

We note that Frontier's forecast is only to 2017, and we are not satisfied that such short-term forecasts invalidate our concerns as market prices likely reflect expectations over a longer period. We note that the RBA forecasts growth in earnings per share to fall in the 2015–16 and 2016–17 financial years, and we do not consider it is certain that investors expect positive growth in dividends per share post-2017.[945]

Biases in analyst forecasts

Analyst forecasts are well understood to be upwardly biased.[946] McKenzie and Partington also consider that analysts' forecasts are slow to adjust to changing information.[947] This creates problems with time matching analyst dividend forecasts with prices. It also implies that dividend growth models may not track changes in the return on equity accurately.

We note that Frontier has not provided any evidence that bias has not increased. Frontier submitted that:[948]

> No reason has been presented for why this effect would be stronger in the current market conditions than it was at the time of the Guideline. Thus, it does

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943 McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, pp. 29–30; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 49–50.

944 Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016, p. 39.

945 RBA, *The Australian Economy and Financial Markets Chart Pack,* February 2016, p. 24.

946 McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, pp. 26, 31; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 46, 51; McKenzie and Partington, *The DGM*, December 2013, pp. 8–9. Also see Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 43.

947 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 31–32; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 51.

948 Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016, p. 39.

> not explain why the AER has apparently reduced the weight it applies to its DGM estimates over time.

We have not changed the weight we apply to the dividend growth model. Our approach requires the application of judgment and our market risk premium estimate does not mechanically update with changes to dividend growth model estimates.

Further, we do not hold a view either way about whether bias has increased or not. However, Frontier refers to a report by JP Morgan that notes that current price-to-earnings ratios[949] could be evidence that the prevailing market is now more sceptical of analysts' forecasts than they have been in the past.[950] That is, bias (or at least the market's perception of bias) may have increased.

Dividends as a proxy for free cash flow to equity

In a particular period, differences between the free cash flow to equity and the dividend may arise as a consequence of financing transactions (that is, borrowing or issuing new shares). Where there is significant financing of dividends and/or where substantial investment demand for funds is anticipated, there is a risk that dividend growth will slow or even turn negative for a period. This is likely to result in the dividend growth model producing upwardly biased estimates of the return of equity.[951]

Low risk free rate and term structure for equity

The risk free rate is currently relatively low. Lally observed that if dividend growth models do not incorporate a term structure, these will produce upwardly biased estimates when the risk free rate is low relative to its long term average, and expected to increase in a future period.[952] We consider it useful to be aware of this potential bias. This is consistent with McKenzie and Partington's advice:[953]

> we do recommend that it be borne in mind that the existence of a term structure could materially change cost of equity estimates from the DGM.

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949 While the JP Morgan report concerns the United States market, Frontier referred to the report as providing insights transferrable to an Australian context (Frontier Economics, *The relationship between government bond yields and the market risk premium*, January 2016, p. 23).

950 JP Morgan, *Musing on low cost of debt and high risk premia*, April 2012, pp. 2-3.

951 McKenzie and Partington, *Report to the AER, Part A: Return on equity* October 2014, pp. 27–29; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 47–49.

952 Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, pp. 11–12.

953 McKenzie and Partington call the market value return on equity, the 'cost of equity'. McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 37; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 56.

E Return on equity conditioning variables

Conditioning variables are market data that can be used to inform (or 'condition') an initial estimate. We do not consider conditioning variables provide reliable estimates on their own.[954] However, this information is relevant and may be useful for indicating changes in prevailing market conditions.

In the Guideline we stated that we would consider three types of conditioning variables to inform our estimate of the market risk premium: dividend yields, yield spreads and implied volatility. Service providers have also proposed the use of price-to-earnings ratios, and we also consider these here. In the Guideline we also stated that we would use yield spreads to inform our overall return on equity estimate.

Conditioning variables should be considered symmetrically through time to avoid bias. Since the weighted average cost of capital (WACC) review in 2009, various service providers have presented this information asymmetrically. For example, in periods where the implied volatility suggested the market risk premium may be significantly above the long term average, service providers relied upon this evidence.[955] However, when implied volatility estimates fell in 2013, service providers did not propose we consider this evidence.[956]

For the reasons set out below, we consider that, overall, the conditioning variables appear to have experienced moderate short term movement. Consideration of the implied volatility approach, dividend yields and corporate bond spreads show slight increases.[957] The state government bond spreads and the comparison between equity and debt premiums provide no clear indication that there have been any changes to conditioning variables.[958] Taken together, we see no significant trend to support any further changes to our approach.

Moreover, it appears that conditioning variables are close to their long term averages. This is particularly apparent when compared with the sharp increases in these variables seen between 2008–13, which were likely associated with the height of the Global Financial Crisis and European debt crisis. We acknowledge that implied volatility and dividend yields increased above their long term averages towards the end of 2015. However, we consider there is insufficient evidence of a sustained trend away from their long term averages.

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954 See: AER, Explanatory statement—Rate of return guideline, December 2013, pp. 94 and 97.

955 See, for example, AER, *Final decision: Envestra Ltd access arrangement proposal for the SA gas network 2011–2016*, June 2011, pp. 195–197; VAA, *MRP for Envestra*, March 2011, p. 4.

956 We note that, during the Guideline development process in 2013, the ENA recently submitted there is a high degree of uncertainty over the relevance of implied volatility. See ENA, *Response to the draft guideline*, October 2013, p. 47.

957 See, Figure 3-6: Implied volatility (VIX) over time; Figure 3-7: Dividends yields; Figure 3-8 Australian bond spreads over government yields.

958 See, Figure 3-9: State government bond spreads over government yields; Figure 3-10: Comparison of equity and debt premiums.

It is important to note that we are estimating a 10 year forward looking market risk premium with regard to prevailing conditions in the market for equity funds. In this context, prevailing conditions can be considered ‘prevailing expectations’ over the relevant forward looking timeframe, which is 10 years. Therefore, we consider short term fluctuations in conditioning variables should be treated with caution.

E.1 Implied volatility

The implied volatility approach is based on an assumption that the market risk premium is the price of risk multiplied by the volume of risk (volatility).[959] Figure 3-7 shows volume of risk in the market portfolio estimated using the implied volatility index.

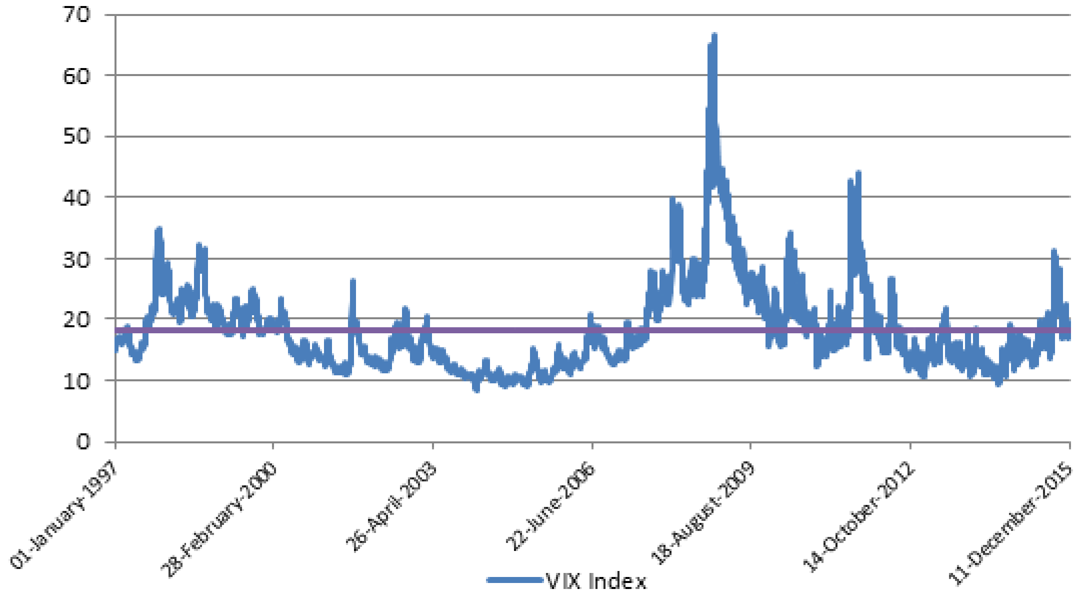
Implied volatility was high during the global financial crisis and the height of the European debt crisis. However, recent implied volatility levels have generally been below or close to the long run average of 18.2 per cent (measured from the start of the data series in 1997). We note that implied volatility levels increased above the long run average in August 2015, but consider it is unclear whether this is evidence of a sharp and sustained move away from the long run average.

Figure 3-7 shows the value of this measure of implied volatility relative to its long run average level since the start of the data series in 1997 to 11 December 2015. On 11 December 2015, the ASX200 implied volatility index was 18.8 per cent. Using the same averaging period as the risk free rate, the volatility index was 20.3 per cent.[960] Over the year ending 11 December 2015, the volatility index was 17.8 per cent. Overall, we consider that Figure 3-7 shows implied volatility is around its long run average.

[959] This was based on Merton, R.C., 'On Estimating the Expected Return on the Market: An Exploratory Investigation', *Journal of Financial Economics*, 1980, Vol. 8, pp. 323–361.

[960] This averaging period is from 16 November 2015 to 11 December 2015.

Figure 3-7 Implied volatility (VIX) over time



Source: ASX200 VIX volatility index, sourced via Bloomberg code AS51VIX from 2/1/2008 and code CITJAVIX prior to 2/1/2008.

E.2 Dividend yields

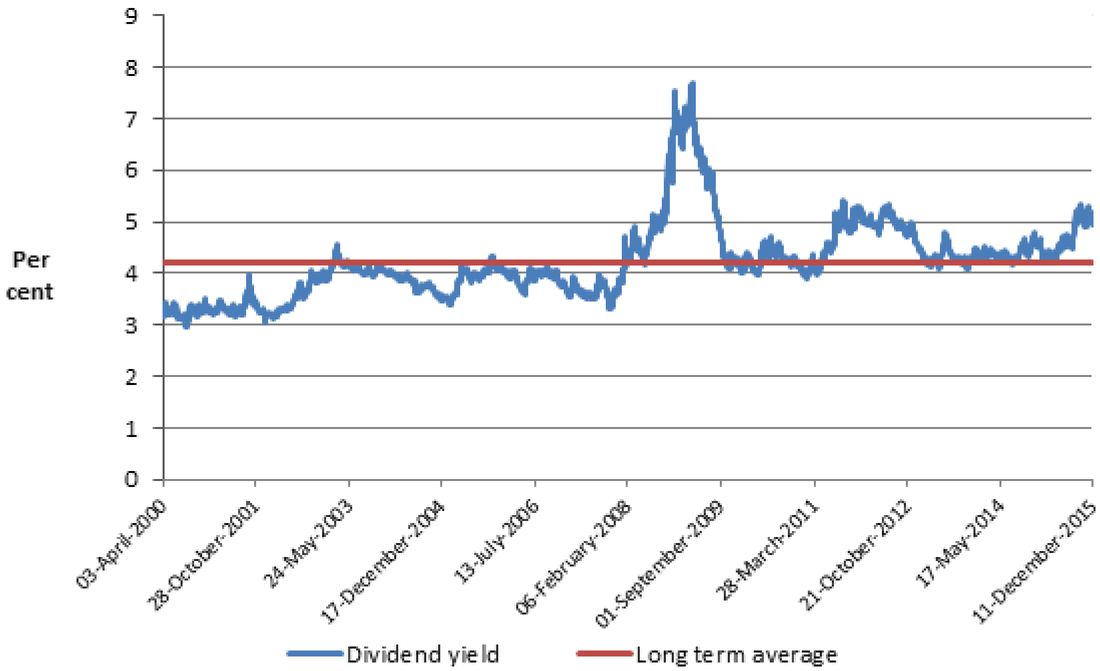
We use dividend yields as a directional indicator of the market risk premium.[961] We consider this information by comparing current dividend yields with the average dividend yield through time.[962] Figure 3-8 shows dividend yields against their historical average up to 11 December 2015.

Figure 3-8 shows dividend yields are higher than their long term average. However, prior to this increase, dividend yields were close to their long term average and have been relatively steady over the last two years (approximately). It is unclear whether the recent increase in dividend yields is evidence of a sharp and sustained move away from their long term average.

961 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 94.

962 For a similar approach, see SFG, *Market risk premium: Report for APT Petroleum Pipelines Ltd*, October 2011, p. 13.

Figure 3-8 Dividend yields



Source: Bloomberg AS51 Index, AER analysis.

E.3 Yield spreads

Yield spreads are the difference between the yields on different assets, typically debt instruments. We examine two categories of yield spreads:

- Credit spreads, used to inform our market risk premium estimate.
- The spread between our equity risk premium and debt risk premium, used to inform our overall return on equity estimate.

Credit spreads are the spreads between the risk free rate (the yield on Australian government securities) and the return on debt for different debt instruments. We use credit spreads as a directional indicator of the market risk premium.[963] We consider this information can be used to indicate changes in market conditions. That is, to indicate whether spreads are widening, stabilising or narrowing.

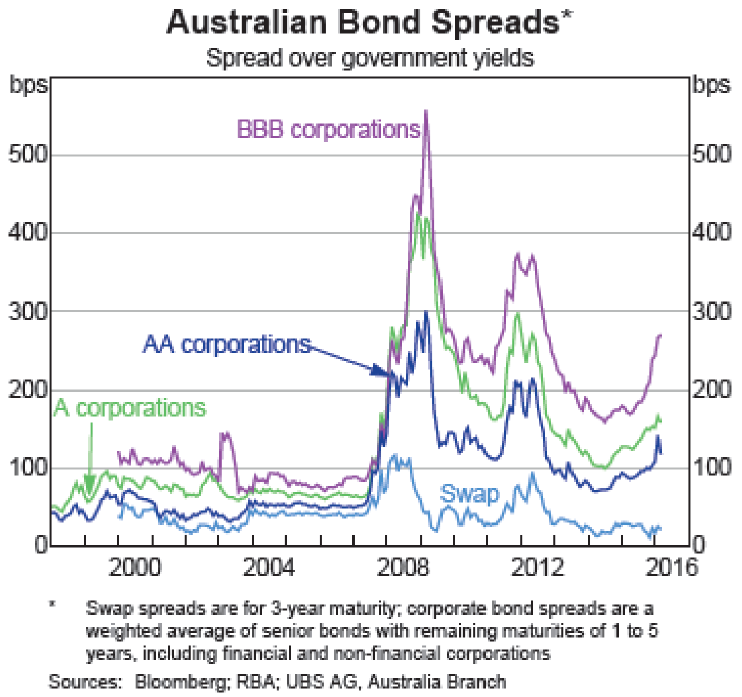
Figure 3-9 shows credit spreads for A-rated, AA-rated, and BBB-rated corporate debt instruments over yields on Australian government securities. These credit spreads were showing a clear downward trend from approximately 2012 before widening slightly in recent times.

Most credit spreads are also above their pre-2007 levels, while the swap rate spread is at or below its pre-2007 levels. In essence, lower quality debt is further from pre-2007

[963] AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 96.

levels than higher quality debt. However, the credit spreads are all substantially lower than they were between 2008 and 2013.

Figure 3-9 Australian bond spreads over government yields

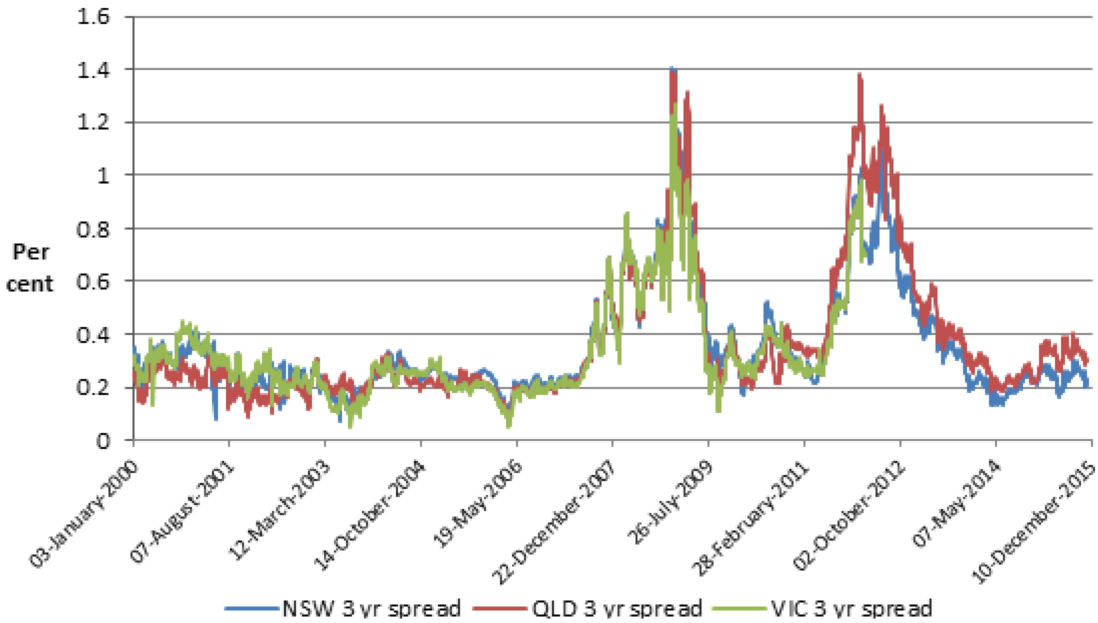


Source: RBA, Chart Pack, February 2016

Note: Swap spreads are for a 3 year maturity. Corporate bonds are a weighted average of senior bonds with remaining maturities of 1 to 5 years and include financial and non-financial corporates.

Figure 3-10 shows the spread between state government debt and Australian government debt up to 10 December 2015. This uses maturities of three years as more data are available. Figure 3-10 shows that credit spreads were falling since late 2012, and are now around their pre-2007 levels with no discernible trend.

Figure 3-10 State government bond spreads over government yields



Source: AER analysis, RBA F.2 interest rate statistics.

On the comparison between the return on equity and return on debt, we consider that prevailing debt market conditions provide support for the view that:

- our estimated return on equity is not below efficient financing costs[964]
- JEN's proposed return on equity is likely to exceed efficient financing costs.

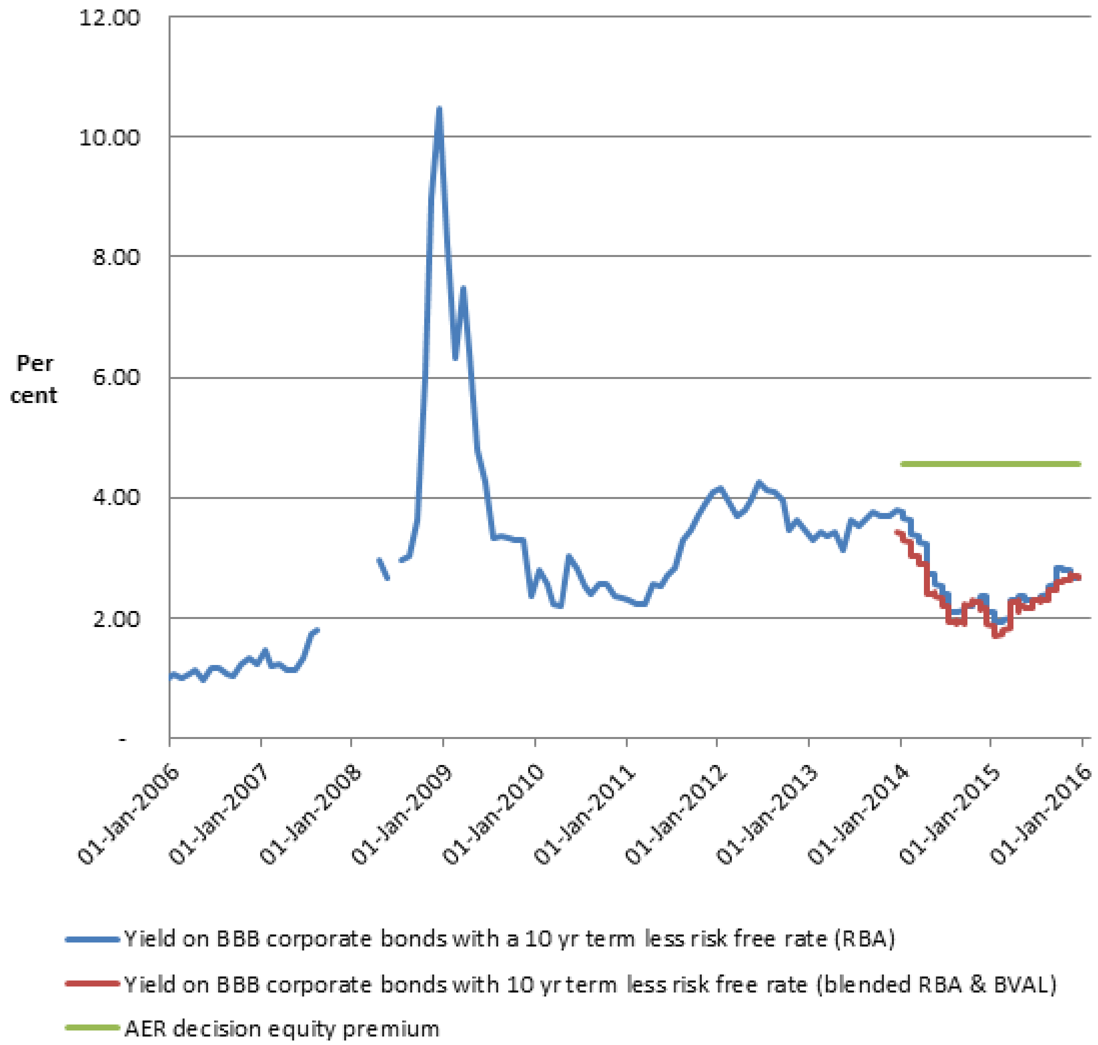
The current debt market is indicating a premium over the risk free rate of about 2.67 per cent.[965] This compares to our foundation model equity premium over the risk free rate of 4.55 per cent (given a market risk premium of 6.5 per cent and a beta of 0.7). Figure 3-11 shows the current and historical debt risk premium and our foundation model equity risk premium. JEN proposed an equity risk premium of 7.14 per cent.[966]

964 Efficient financing costs for a benchmark efficient entity with a similar degree of risk as that which applies to the distribution network service provider in respect of the provision of standard control services. See: NER, cl. 6.5.2(c); NER, cl. 6A.6.2(c); NGR, r.87(3).

965 Based on the spread to CGS from our estimation of the cost of debt (based on an average of the RBA's data (on yield to maturity on BBB-rated corporate bonds with a ten year term and the Bloomberg BBB–rated AUD BVAL curve).

966 Based on a proposed return on equity of 9.89 per cent and an indicative risk free rate of 2.75 per cent (see: JEN, *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, pp. 44, 88).

Figure 3-11 Comparison of equity risk premium and indicative debt risk premiums



Source: AER analysis, RBA interest rates statistics, Bloomberg data.

We do not consider that the current 188 basis points difference between the equity risk premium allowed in this decision and debt risk premiums[967] to be too low, on the basis of:

- the low risk nature of a benchmark efficient entity as outlined above
- the gap between the equity risk premium and debt risk premium is likely to be wider than stated above, since it compares a promised, pre-tax return on debt to an expected, post-tax return on equity.[968]

[967] The debt risk premiums to CGS are calculated as the extrapolated effective annual yield to maturity on BBB rated debt with 10 years to maturity less the effective annual yield to maturity on CGS with 10 years to maturity). BBB bond yields have been used instead of BBB+ because the RBA quotes BBB yields to maturity.

In relation to our review of debt risk premiums relative to equity premiums in our April 2015 decisions, ActewAGL submitted:[969]

> In relation to more stable market conditions, ActewAGL Distribution does not consider that the AER provides any supporting evidence that 260 basis points is a sufficient margin. Noting that the debt risk premium for a long time has been between 2 and 4 per cent indicates that the ERP of 4.55 per cent is low when compared with the last 8 years. ActewAGL Distribution also considers that the 'flight to safety' in relation to the decreasing CGS values are very likely to have influenced the return on debt

We agree that it is difficult to derive definitive conclusions about equity premiums from data on debt premiums, which is one of the reasons why we give this material a directional role.[970] It is therefore unclear how ActewAGL reconciles this difficulty in extracting precision from this material with its statement that an equity risk premium of 4.55 per cent is too low. We consider that it is far from clear that a 'flight to safety' has impacted recent risk premiums. As noted by Partington, an alternative and equally plausible view is that low yields on Australian government securities may have driven investors to 'search for yield' with the result of decreasing risk premiums.[971]

We note that the overall directional evidence shows that debt risk premiums have increased since around mid-2015, but remain below the levels in December 2013 (when our Rate of Return Guideline was published), as shown in Figure 3-11.

We have also examined estimates from broker reports of the spread between debt and equity risk premiums for comparable businesses (see Figure 3-12). Recent broker estimates appear to have trended downwards, however there has been a limited number of recent reports. We consider that this data does not provide a clear indication of brokers' views on recent movements in risk premiums.

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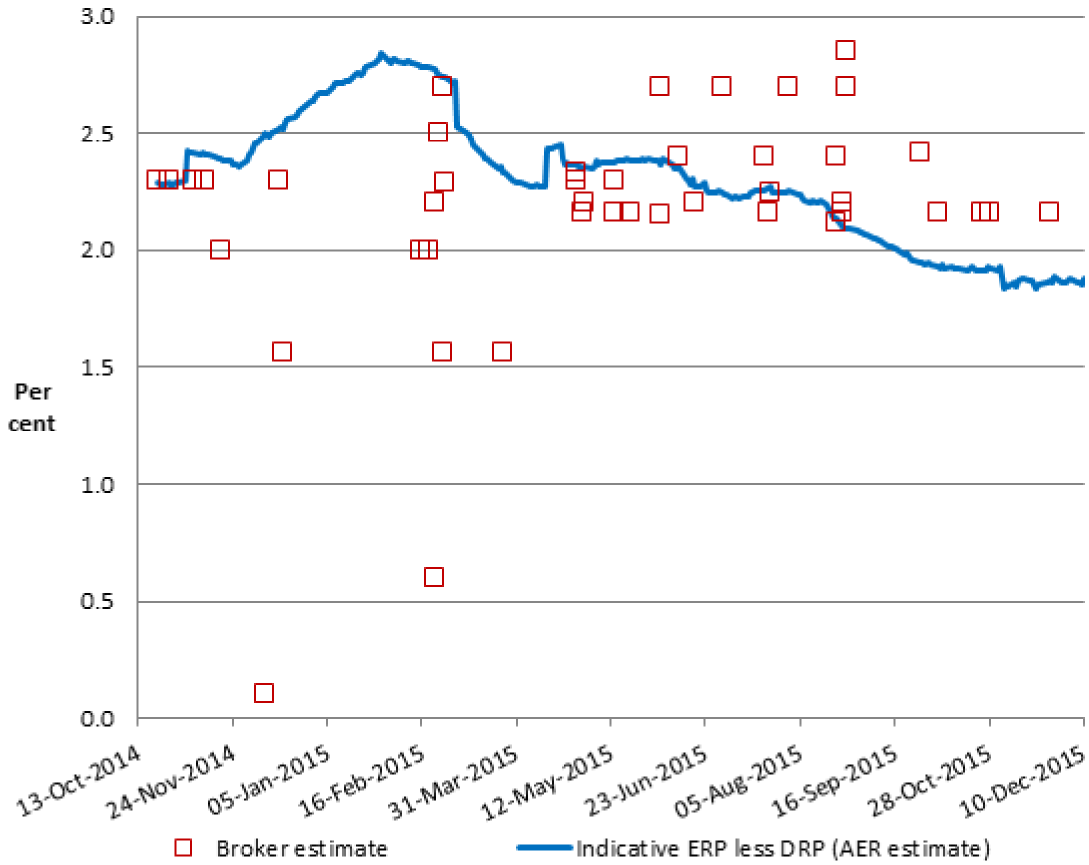
[968] We consider that promised returns will always exceed expected returns and pre-tax returns will always exceed corresponding post-tax returns. For further explanation, see McKenzie and Partington, *Report to the AER: The relationship between the cost of debt and the cost of equity*, March 2013, pp. 7, 21; AER, *Final decision: Access arrangement final decision—Multinet Gas (DB No. 1) Pty Ltd, Multinet Gas (DB No. 2) Pty Ltd 2013-17*, March 2013, Part 3, p. 48.

[969] ActewAGL Gas Distribution, *Appendix 8.02: Return on Equity - detailed proposal*, June 2015, p. 48.

[970] AER, *Better Regulation: Explanatory Statement: Rate of return guideline (appendices)*, December 2013, pp. 46–48; AER, *Preliminary decision: CitiPower determination 2016 to 2020, Attachment 3–Rate of return*, October 2015, pp. 96–99; AER, *Powercor Preliminary Decision - Attachment 3: Rate of Return*, October 2015, pp. 96–100; AER, *Draft decision ActewAGL distribution determination 2016 to 2021: Attachment 3 – Rate of return*, November 2015, pp. 97–98; AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 94–99; AER, *Draft decision Australian Gas Networks Access Arrangement 2016 to 2021: Attachment 3 – Rate of return*, November 2015, pp. 96–100; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 94–98; AER*, Preliminary decision AusNet Services determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 94–98; AER, *Draft decision Amadeus Gas Pipeline access arrangement 2016 to 2021: Attachment 3–Rate of return*, November 2015, pp. 97–100. .

[971] Partington, *Report to the AER: Return on Equity (updated),* April 2015, p. 72.

Figure 3-12 Difference between equity and debt premiums in broker reports



Source: AER analysis of various relevant broker reports, RBA and Bloomberg data.

Notes: The broker estimate of the difference between equity and debt risk premium is calculated by deducting brokers' debt risk premium from their equity risk premium.

The indicative estimate is calculated by deducting an estimate of the indicative debt risk premium from the equity risk premium for this decision. The indicative debt risk premium is estimated as the yield on BBB-rated corporate bonds (a simple average of the RBA corporate bond data and Bloomberg BVAL curve) less the yield on 10-year CGS.

F Other practitioner's return on equity estimates

Other market practitioners may, in the course of their operations, produce return on equity estimates for entities with a similar degree of risk as JEN. Other practitioners may also produce estimates of input parameters required in the Sharpe-Lintner CAPM (our foundation model). These estimates may be relevant material that can inform our return on equity estimation.

Relevant estimates of other market practitioners are typically sourced from surveys, broker reports, valuation reports, and other regulators' decisions. Such estimates are discussed further in the subsections below.

We have focused on return on equity estimates for companies with a similar degree of non-diversifiable risks as JEN in providing regulated (standard control) services. This means that greater reliance is placed on electricity and gas network service providers over other types of businesses. Greater reliance is also placed on businesses with revenues that are substantially regulated over businesses with less regulated revenue. We take this approach as it better reflects the degree of risk of JEN in relation to the provision of regulated services.

We have also focused on the equity risk premium rather than the overall return on equity to isolate the business-specific risk premium from movements in the risk free rate.[972]

Service providers stated that past decisions of other regulators should not be used as direct evidence of the required return on equity, as they are, 'at best, secondary evidence of the prevailing return on equity at previous points in time' and 'use of such decisions will be circular and self-perpetuating'.[973] We note that some estimates from other market practitioners—including from survey respondents, brokers and valuers—

[972] Note that the valuation reports show there is a general consensus among valuers on the estimation methods for the risk free rate. Valuers typically estimate the risk free rate as the current yield to maturity on long term (10 year) Australian government securities. We acknowledge that there is some evidence suggesting that there is a tendency for valuers to adopt risk free rates exceeding the yields on Australian government securities when these yields are low, but we consider this practice to be neither widespread nor persistent (see section F.5 for more detail). Therefore, we do not consider that removing the risk free rate and examining the equity risk premium will bias the results.

[973] CitiPower, *Revised regulatory proposal 2016–2020*, pp. 321; Powercor, *Revised regulatory proposal 2016–2020*, pp. 315; JEN (Vic), *2016–20 Electricity distribution price review regulatory proposal revocation and substitution submission: Attachment 6–1 Rate of return, gamma, forecast inflation, and debt and equity raising costs,* 6 January 2016, p. 80; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 74–75, United Energy, *Response to AER Preliminary Determination Re: Rate of return and gamma*, January 2016, p. 75; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, p. 101; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 78–79.

may be affected to some extent by 'herding' behaviour.[974] We continue to consider that it is relevant for us to have some regard to these estimates, as long as we remain aware of their limitations.

F.1 Prevailing estimates: surveys

Survey estimates explore investor expectations about the market risk premium. They achieve this by directly asking investors and market practitioners what their expectations are and/or what they apply in practice. We place some reliance on survey estimates in estimating the market risk premium.

Table 3-33 shows that market risk premium estimates, from surveys published since 2013, cluster around 6.0 per cent. The 2015 survey estimates are generally equal to or lower than their 2013 and 2014 counterparts. This provides some evidence to suggest that investor expectations of the market risk premium have not increased, and may have eased.

Table 3-33 Key findings on market risk premium from recent surveys

Survey	Numbers of responses	Mean (%)	Median (%)	Mode (%)
Fernandez et al (2013)	73	5.9	6.0	N/A
KPMG (2013)[a]	19	N/A	6.0	6.0
Fernandez et al (2013)	17	6.8	5.8	N/A
Asher and Hickling (2013)	46	4.8	5.0	6.0
Fernandez et al (2014) [b]	93	5.9	6.0	N/A
Asher and Hickling (2015) [c]	27	4.4	4.6	6.0
Fernandez et al (2015)	40	6.0	5.1	N/A
KPMG (2015) [d]	~27	N/A	6.0	6.0

Sources: Several survey reports.[975]

Notes: a) While this survey had 23 market participants, 19 specified what market risk premium they used.

b) The 2014 survey did not report the response rate. AER staff obtained this information from Professor Fernandez via email correspondence on 22 July 2014.

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974 McKenzie and Partington, *Report to the AER: Part A: Return on Equity*, October 2014, p. 46.

975 KPMG, *Australian valuation practices survey 2015*, May 2015; Fernandez, Ortiz, Acín, *Discount rate (risk-free rate and market risk premium) used for 41 countries in 2015: a survey*, April 2015; Asher and Hickling, *Equity Risk Premium Survey 2014*, Actuaries Institute, April 2015; Fernandez, Linares, Acín, *Market Risk Premium used in 88 countries in 2014*, IESE Business School, June 2014; Asher and Hickling, *Equity Risk Premium Survey*, Actuary Australia, December 2013; Fernandez, Arguirreamalloa and Linares, *Market Risk Premium and Risk Free Rate used for 51 countries in 2013*, IESE Business School, June 2013; KPMG, *Valuation Practices Survey 2013*, February 2013; Fernandez, Arguirreamalloa and Corres, *Market Risk Premium used in 82 Countries in 2012*, IESE Business School, January 2013.

c) The response rate for this survey is lower than the response rate in previous Asher and Hickling surveys because the survey took place from 5 December 2014 to 14 December 2014, which was very close to Christmas. AER staff obtained the mode from Associate Professor Anthony Asher via email correspondence on 17 September 2015.

d) The KPMG (2015) survey had 29 market participants, but figure 24 indicates that not all the market participants gave a response for the market risk premium. However, visual inspection indicates that the response rate was approximately 27.

Several factors should be considered when examining survey evidence:[976]

- Timing of the survey—we consider the timing of each survey is clear in all but two surveys we consider. The earliest survey we consider was published in January 2013 but its questionnaires were sent out in May and June 2012.[977]
- Sample of respondents—financial managers and analysts, expert valuers, actuaries, finance academics, investment banks, professional services firms and infrastructure funds were among the target respondents of surveys. These professionals apply the market risk premium, so we consider the surveys' target populations can make informed judgments about the market risk premium. Each survey also sets out the selection of the sample surveyed (or respondents).[978]
- Wording of survey questionnaires—we consider the adequacy of survey wording can be subjective to judge and often relies on the quality of the authors. However, we also consider confidence in this area can be enhanced when the work is published in a refereed academic journal, or when the survey is repeated. In our sample, only the KPMG survey has not been repeated at least three times.
- Survey response rate and non-response bias—McKenzie and Partington suggested a sample size of more than 30 is sufficiently large statistically so a representative sample of 30 respondents is expected to be adequate.[979]

After having regard to the above factors, we consider that the survey estimates in Table 3-33 are useful for informing our market risk premium estimate. We note that triangulation across surveys can reduce the limitations associated with particular survey evidence.[980]

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976 As noted in: Australian Competition Tribunal, *Application by Envestra Limited (No 2) [2012] ACompT 3*, 11 January 2012, paragraphs 165–166.

977 The KPMG valuation practices surveys do not clearly state the time period over which the survey was made. Fernandez, Ortiz, Acín, *Discount rate (risk-free rate and market risk premium) used for 41 countries in 2015: a survey*, April 2015, p. 2; Asher and Hickling, *Equity Risk Premium Survey 2014*, Actuaries Institute, April 2015, p. 1; Fernandez, Linares, Acín, *Market Risk Premium used in 88 countries in 2014*, IESE Business School, June 2014, p. 2.

978 KPMG, *Australian valuation practices survey 2015*, May 2015, p. 2; Fernandez, Ortiz, Acín, *Discount rate (risk-free rate and market risk premium) used for 41 countries in 2015: a survey*, April 2015, p. 3; Asher and Hickling, *Equity Risk Premium Survey 2014*, Actuaries Institute, April 2015, p. 1; Fernandez, Linares, Acín, *Market Risk Premium used in 88 countries in 2014*, IESE Business School, June 2014, p. 2.

979 McKenzie and Partington, *Supplementary report on the MRP*, February 2012, pp. 17–18.

980 McKenzie and Partington considered triangulation increases their confidence in the results from survey evidence. McKenzie and Partington, *Supplementary report on the MRP*, February 2012, pp. 17, 19–20.

SFG submitted that survey evidence does not reflect expected market risk premium because the respondents are simply regurgitating historical excess returns.[981] We do not agree. We consider that the survey questions and responses indicate that the estimates reflect investors' expectations of the market risk premium. What evidence investors use to form their expectations is their choice and, in our view, does not deem these estimates irrelevant.

Several service providers also submitted that the surveys we use do not appear to comply with the Federal Court guidelines for conducting surveys.[982] Market participants prepare survey material for practical purposes and it would be unreasonable to expect that all material we consider would be prepared in compliance with the Federal Court guidelines. We carefully consider the merits of all of the material available to us.

F.2 Prevailing estimates: broker reports

Table 3-34 shows the estimates of return on equity and premium above the risk free rate contained in broker reports which we have examined since our preliminary decision.[983]

Table 3-34 Recent broker reports

		Return on equity	Equity risk premium
Broker estimate—no imputation adjustment	Minimum	6.4	3.7
Broker estimate—no imputation adjustment	Maximum	11.3	6.5
Broker estimate—adjusted for imputation	Minimum	6.9	4.2
Broker estimate—adjusted for imputation	Maximum	12.1	7.1

Source: AER analysis of broker reports, dated 7 September 2015 to 10 December 2015 by Credit Suisse, JP Morgan, Morgan Stanley, and Macquarie Bank that include a valuation for AusNet Services, Spark Infrastructure, APA Group, and/or DUET Group.

The equity risk premium from the AER's foundation model of 4.55 per cent is within the range of premiums recently estimated by brokers, even when these estimates are

981 See: SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 66–71; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 42–47; SFG, *The required return on equity for the benchmark efficient entity*, February 2015, p. 26. Also, in a subsequent 2015 report for JGN, SFG submitted that survey evidence reflects historical information because the surveys we consider 'almost invariably' report an MRP of 6.0 per cent (see: SFG, *Cost of equity: Update for Jemena Gas Networks' averaging period —19 January to 16 February 2015*, 27 March 2015, p. 7).

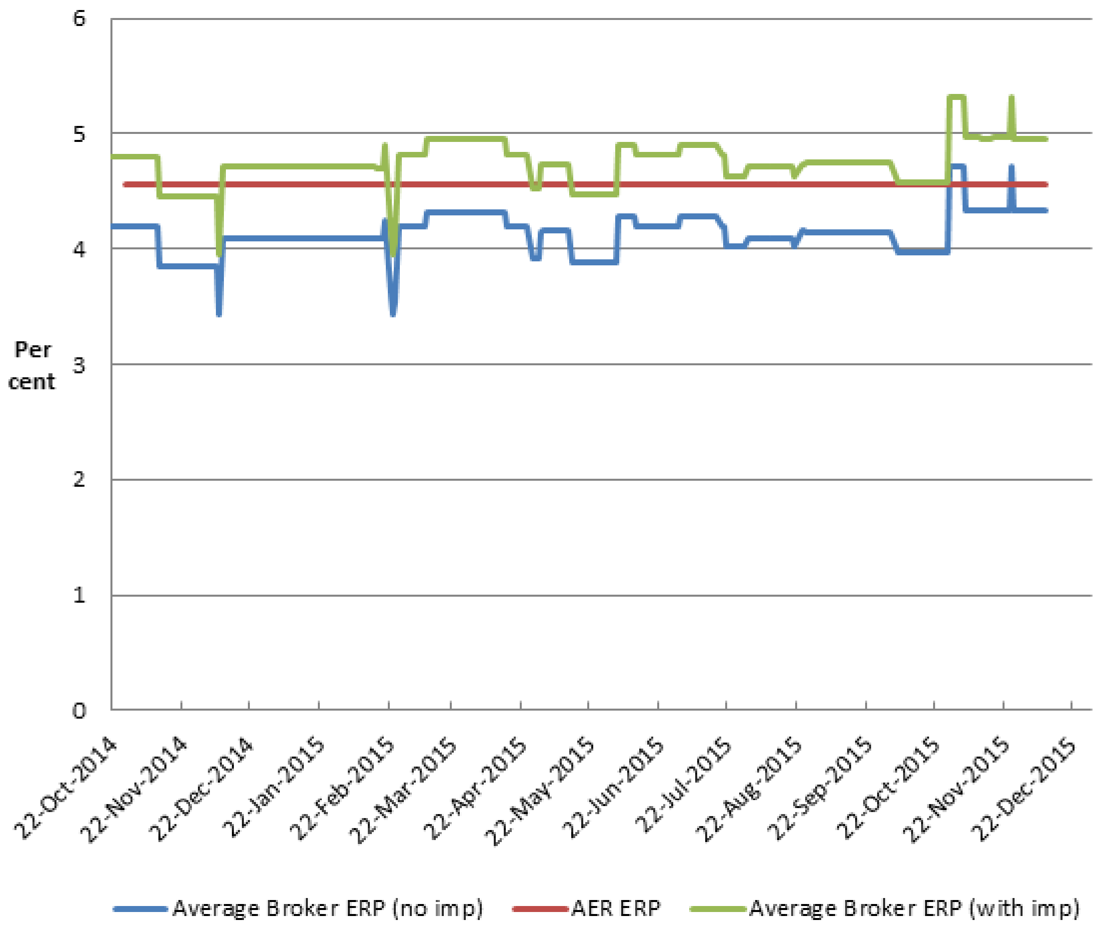
982 See, for example, AusNet Services, *Regulatory proposal*, 30 April 2015, p. 324; United Energy, *Regulatory proposal: Attachment—Return on equity*, April 2015, section 2.7.7.3; Jemena Electricity Networks, *Regulatory proposal: Attachment 9-2—Rate of return proposal,* April 2015, p. 75; Federal Court of Australia (PA Keane Chief Justice), *Practice note CM 13: Survey evidence*, 1 August 2011.

983 The ranges given in Table 3-34 capture the most recent report from each broker on each of the stated companies in this time period.

adjusted for imputation. JEN's proposed equity risk premium of 7.14 per cent is at the upper bound of the range of premiums recently estimated by brokers.

Directionally, as shown in Figure 3-13, it appears that both the lower and upper bounds of equity risk premium estimates from broker reports have risen since our review in our October 2015 preliminary decision. Our equity risk premium estimate remains, in general, below the imputation-adjusted broker estimates and above the unadjusted broker estimates. We do not consider that the directional evidence currently supports a move away from the return on equity resulting from our Guideline approach.

Figure 3-13 Equity risk premium estimates from broker reports



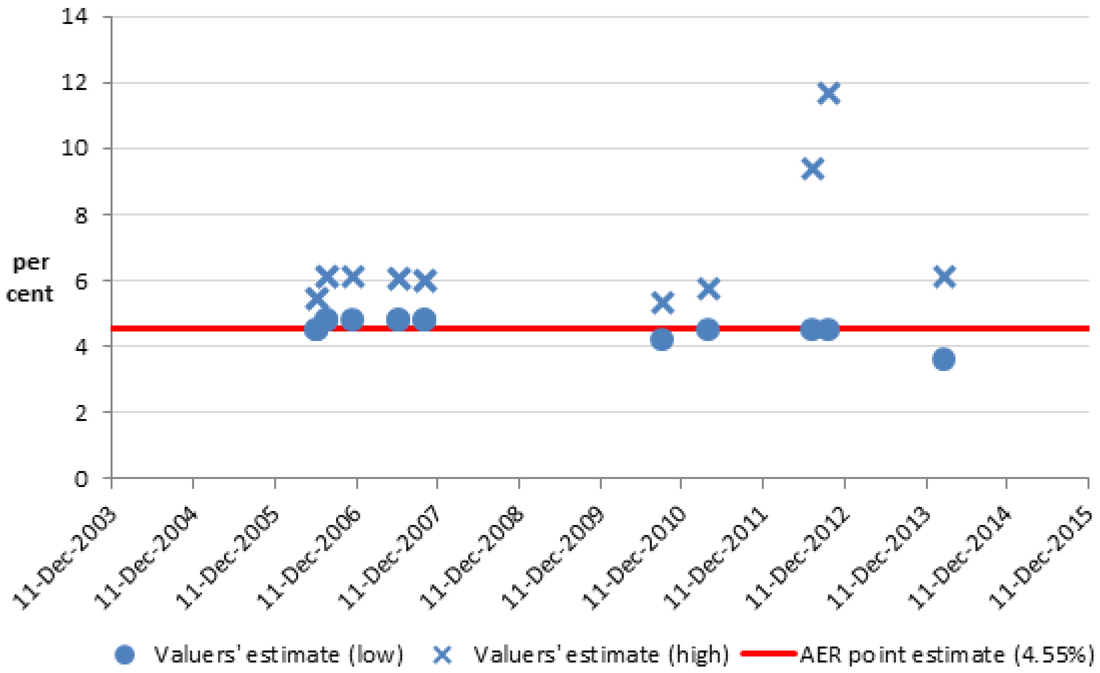
Source: AER analysis of broker reports by Credit Suisse, JP Morgan, Morgan Stanley, and Macquarie Bank that include a valuation for AusNet Services, Spark Infrastructure, APA Group, and/or DUET Group.

Notes: Average broker ERP is the mean of estimates from all brokers and for all businesses available at the time. The

F.3 Prevailing estimates: valuation reports

Figure 3-14 outlines the range of return on equity and equity risk premium estimates from relevant independent valuation reports. We consider that the number of reports is too low and the concentration of reports among only a few valuers is too high to be able to place significant reliance on the evidence from valuation reports.[984]

Figure 3-14 Equity risk premium from relevant valuation reports over time



Source: AER analysis of reports from the Thomson Reuters Connect4 database

Notes: We have shown the equity risk premium based on a nominal vanilla WACC, expert reports using a different WACC form have been adjusted accordingly. This equity risk premium ('Valuers estimate-high') also reflects the impact of any discretionary uplifts applied by the independent valuer.

There have been only 18 relevant independent valuation reports spanning a period going back to 1991.[985] Only 12 reports included a discounted cash flow analysis with information on a return on equity estimate. These 12 reports were provided by only three independent valuation firms, with 9 of the 12 reports being provided by Grant Samuel & Associates.

We note that the ranges for return on equity and equity risk premium estimates contained in Figure 3-14 include the final values used in the independent valuation reports and reflect any uplifts applied. However, as noted in Table 3-7, we have concerns about the applicability of these uplifts to the allowed rate of return

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984 We note that the correction of a small number of errors in Incenta Economic Consulting's analysis of valuation reports resulted in material changes to its results. See: Incenta Economic Consulting, *Addendum to report titled 'Update on evidence on the required return on equity from independent expert reports'*, 20 August 2014, p. 1.

985 The Thomson Reuters' Connect 4 database contains reports going back to 1991, but contains no reports between 1991 and 1998 for comparable electricity or gas network businesses. A list of the reports assessed in this report can be found in Table 3-20 of AER, *Draft Decision: TransGrid transmission determination*, 2015–16 to 2017–18, Attachment 3–Rate of return, November 2014.

objective.[986] We also have concerns that the adjustment for dividend imputation may not be appropriate (see Table 3-7). The risk premium appropriately reflecting dividend imputation is likely somewhere between the adjusted and unadjusted premiums, but we are unable to distil a precise estimate due to a lack of transparency in valuation reports.

The most recent report for a regulated energy network business is Grant Samuel's report for Envestra on 4 March 2014. We find that this evidence does not support a move away from our foundation model estimate of 4.55 per cent. We note that:

- Grant Samuel's initial Sharpe-Lintner CAPM-based return on equity estimate provides an equity risk premium range of 3.6 to 4.2 per cent (without adjustment for dividend imputation, 4.1 to 4.8 per cent including our estimated adjustment for dividend imputation).
- Grant Samuel outlined four separate uplift scenarios that supported its discretionary uplift to its rate of return above the initial Sharpe-Lintner CAPM-based estimate.[987] Although we have concerns with the applicability of these uplifts to the allowed rate of return objective, our foundation model premium is above or within the equity risk premium range in three of the four scenarios if no adjustments are made for dividend imputation.[988]

In response to our preliminary decision, service providers submitted that it is not clear how we arrived at our imputation-adjusted equity risk premium range.[989] This range was calculated using the premiums implied by the low (high) equity beta estimate given by the independent valuer for the bottom (top) of the range for each independent valuation report.

[986] See Appendix E.6. 'Return on equity estimates from other practitioners' in the October and November 2015 decisions for more detail.

[987] These being (1) increased risk free rate, (2) increased market risk premium, (3) broker estimates of return on equity, and (4) DGM estimates of return on equity.

[988] Grant Samuel's submission in response to our November 2014 decisions provided some clarification about its use of uplifts and dividend imputation in its Envestra valuation report. However, we considered that this clarification did not affect the fundamental premise of our concerns and hence did not support a change to our approach (for more detail, see sections E.3 and E.6 of Attachment 3 to CitiPower's draft decision). In its revised proposal, CitiPower submitted that our consideration of both imputation-adjusted estimates and unadjusted estimates is illogical given Grant Samuel's submission [CitiPower, *Revised regulatory proposal 2016–2020*, pp. 320]. CitiPower provided no additional information about Grant Samuel's Envestra valuation report and hence our consideration of it is unchanged.

[989] CitiPower, *Revised regulatory proposal 2016–2020*, pp. 317–318; Powercor, *Revised regulatory proposal 2016–2020*, pp. 311–312; ActewAGL, *Revised 2016–21 access arrangement proposal Response to the AER's draft decision, Appendix 5.01 Detailed response to rate of return, gamma and inflation*, January 2016, pp. 96–98; United Energy, *Response to AER preliminary determination–Re: rate of return and gamma*, 6 January 2016, pp.71–72; AGN, *2016–17 to 2020/21 Access Arrangement information response to draft decision: Attachment 10.26 Response to draft decision: rate of return*, January 2016, pp. 75–76; AusNet Services, *Electricity distribution price review 2016–20 Revised regulatory proposal: Chapter 7 Rate of return & gamma*, 6 January 2016, pp. 70–72

F.4 Prevailing estimates: other regulators

The estimates of return on equity from other regulators' decisions (dated between August 2015 and December 2015) range from 6.96 to 12.55 per cent. The premium above the risk free rate from these return on equity estimates decisions ranges from 4.20 to 9.49 per cent.[990]

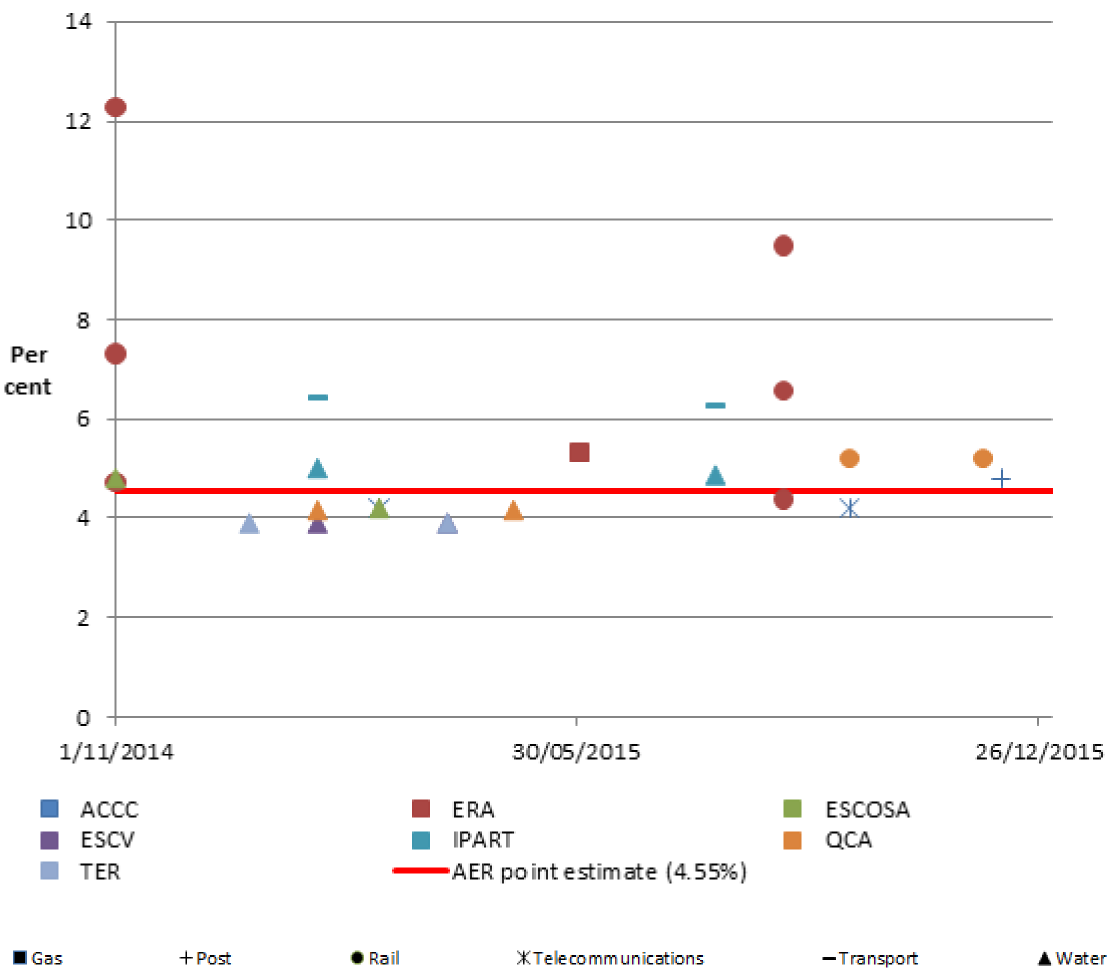
The equity risk premium from our foundation model of 4.55 per cent is within the range of premiums recently estimated by other regulators. Directionally, the range of equity risk premium estimates appears broadly consistent with those examined in our previous decisions[991] as shown in Figure 3-15.[992]

990 Independent Pricing and Regulatory Tribunal, *Fact sheet: WACC biannual update*, August 2015; Economic Regulatory Authority of Western Australia, *Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks*, 18 September 2015; Queensland Competition Authority, *Queensland Rail's 2015 Draft Access Undertaking: Draft Decision*, October 2015; Australian Competition and Consumer Commission, *Public inquiry into final access determinations for fixed line services: Final decision*, October 2015; Queensland Competition Authority, *Aurizon Network 2014 Draft Access Undertaking — Volume IV: Maximum Allowable Revenue*, December 2015; Australian Competition and Consumer Commission, *ACCC decision on Australian Postal Corporation 2015 price notification*, December 2015;

991 Our April and June 2015 decisions examined decisions by other regulators from November 2014 to March 2015. Our October and November 2015 decisions examined decisions by other regulators from March to June 2015.

992 Note that the risk characteristics of rail businesses such as The Pilbara Infrastructure Pty Ltd (an operator of a rail network that transports iron ore freight) may be significantly different to those of the benchmark efficient entity (for example, due to demand risk). Similar concerns may be expressed about Brookfield Rail and IPART Transport decisions. We also note that the ERA's use of the Wright approach to estimating market risk premium is influenced by its annuity pricing framework. The ERA states: "A key consideration in the context of the rail WACC relates to the purpose. The estimate is required to contribute to the annuity that will deliver the value of the rail infrastructure assets, over their economic life. Given the length of the rail asset economic lives, the estimate is long term." [ERA, *Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks – Revised Draft Decision*, November 2014, p. 89.] Nevertheless, we have included these decisions for comparative purposes.

Figure 3-15 Equity risk premium estimates from other regulators' decisions



The estimates of the market risk premium from other regulators' decisions (dated between August 2015 and December 2015) range from 6 to 7.3 per cent.[993] Figure 3-16 shows that our estimate (6.5 per cent) of the market risk premium is consistent with the range of estimates from other regulators over time.

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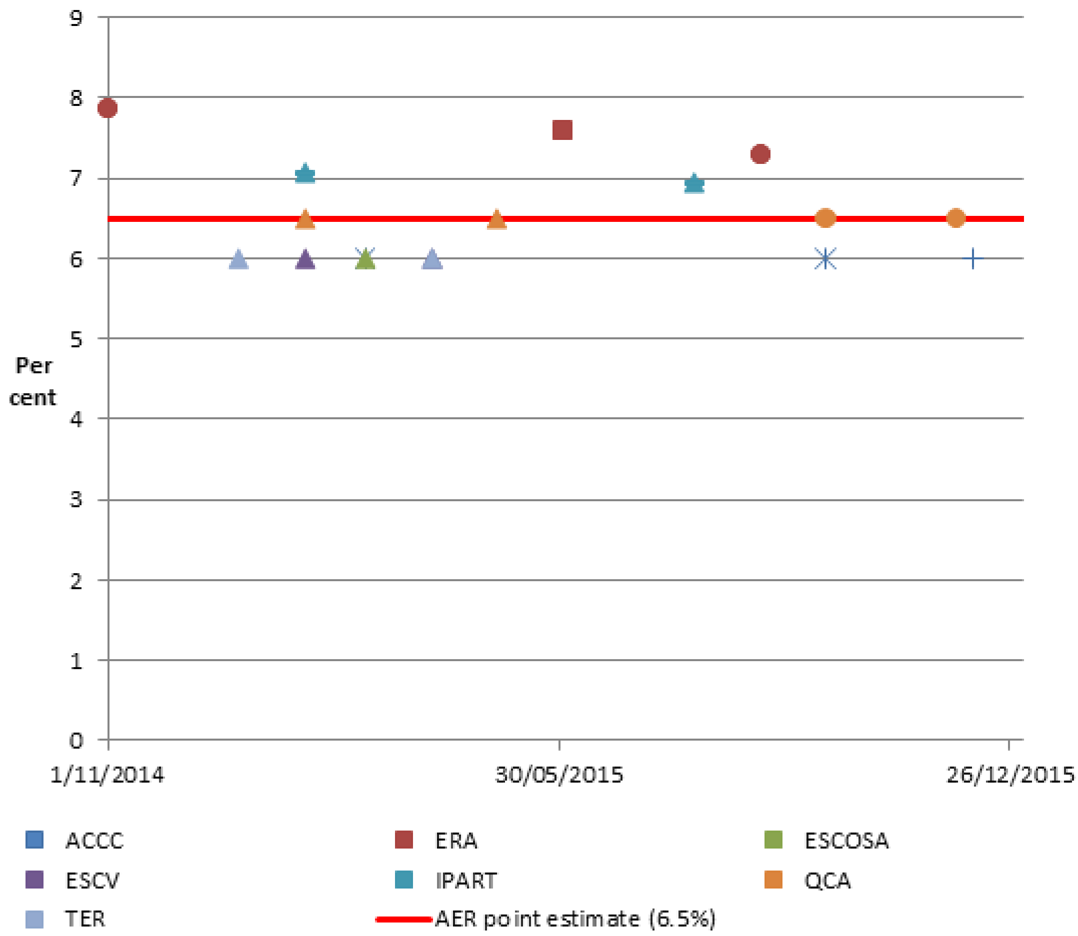
993 Independent Pricing and Regulatory Tribunal, *Fact sheet: WACC biannual update*, August 2015; Economic Regulatory Authority of Western Australia, *Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks*, 18 September 2015; Queensland Competition Authority, *Queensland Rail's 2015 Draft Access Undertaking: Draft Decision*, October 2015; Australian Competition and Consumer Commission, *Public inquiry into final access determinations for fixed line services: Final decision*, October 2015; Queensland Competition Authority, *Aurizon Network 2014 Draft Access Undertaking — Volume IV: Maximum Allowable Revenue*, December 2015; Australian Competition and Consumer Commission, *ACCC decision on Australian Postal Corporation 2015 price notification*, December 2015

Figure 3-16 Market risk premium estimates from other regulators' decisions



F.5 Relationship between risk free rate and market risk premium in valuation reports

JEN submitted reports from Incenta Economic Consulting, NERA, and Houston Kemp that claimed that there is evidence of an inverse relationship between the risk free rate and the market risk premium in recent estimates by independent valuers.

We considered the submissions by Incenta and NERA in our preliminary decision, with our overall assessment being that there is not sufficient evidence to establish the existence of such a relationship in valuers' estimates.[994] This is because:

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994 AER, *CitiPower Preliminary Decision - Attachment 3: Rate of Return*, October 2015, pp. 528-534; AER, *Powercor Preliminary Decision - Attachment 3: Rate of Return*, October 2015, pp. 528–535; AER, *Draft decision ActewAGL distribution determination 2016 to 2021: Attachment 3 – Rate of return*, November 2015, pp. 541–550; AER, *Preliminary decision United Energy determination 2016 to 2020: Attachment 3 – Rate of return*, October 2015, pp. 270–272, 524–539; AER, *Draft decision Australian Gas Networks Access Arrangement 2016 to 2021: Attachment*

- Incenta's sample is too small to support a reliable inference.
- NERA's regression results are driven by its unsupported assumption that any difference between a valuer's stated risk free rate and the prevailing yield on Commonwealth government securities is to be taken as part of their adopted market risk premium.

As HoustonKemp's analysis uses the same methods to that of NERA, our criticisms of NERA's analysis in our preliminary decision are equally applicable to it. These reasons were supported by Partington and Satchell.[995] We discuss our reasons for not accepting the submissions by Incenta, NERA, and Houston Kemp further in the following sections. We do not consider that there is sufficient evidence before us to depart from our original assessment.

F.5.1 Our assessment of Incenta's submission

We continue to consider our criticisms of Incenta's submission in our preliminary decision to be justified. Incenta plotted the equity risk premium estimates in 13 independent valuation reports for regulated infrastructure business against the prevailing risk free rate, stating that 'it would be incorrect to assume that the total risk premium is independent of the risk free rate, but rather that there is a clear inverse relationship'.[996]

We do not consider that Incenta's evidence supports the view that there is any clear relationship between the risk free rate and risk premiums. This is because:

- As Partington states with reference to Incenta's plot of equity risk premium estimates, 'making [a] reliable inference in a sample of 13 observations is extremely difficult' and 'the inference in the report is highly speculative at best'.[997]
- It is not clear to us that any inverse correlation between the risk free rate and valuers' equity risk premium estimates is not just reflecting a positive correlation between the equity and debt risk premiums.
- We note each valuation report in Incenta's sample is for a different business. Therefore, differences in the valuers' equity beta estimates could be driving the differences in their equity risk premium estimates, as opposed to movements in the

3 – Rate of return, November 2015, pp. 275–277, 530–542; AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 269–271, 525–539; AER, *Preliminary decision AusNet Services determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 269–270, 529–535; AER, *Draft decision Amadeus Gas Pipeline access arrangement 2016 to 2021: Attachment 3–Rate of return*, November 2015, pp. 269–273.

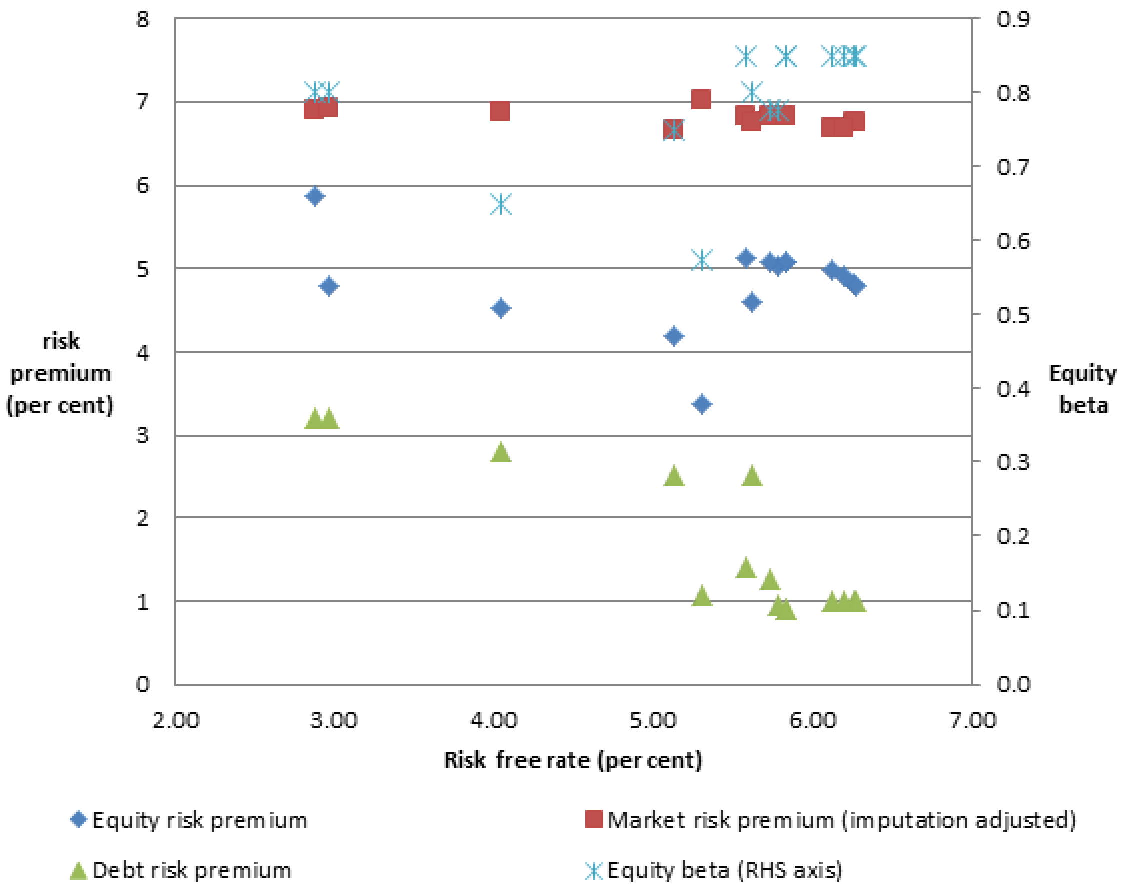
995 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 28; Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 36.

996 Incenta Economic Consulting, *Further update on the required return on equity from independent expert reports*, Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon Energy, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, p. 19.

997 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 28.

risk free rate as Incenta claims. . We compared the equity risk premium, debt risk premium and risk free rate for comparable firms in the preliminary decision.[998] Figure 3-17 shows that the market risk premium remains relatively stable which indicates that it is the choice of equity beta that is driving movement in the equity risk premium.

Figure 3-17 Comparison of parameter estimates from relevant valuation reports



Source: AER analysis of reports from the Thomson Reuters Connect4 database

Incenta also submitted that there is merit in examining directional evidence on the return on the market estimates from valuation reports.[999] We consider that examining the market return estimated by independent valuers facilitates the inclusion of all valuation reports (not just those reports for relevant businesses) and removes the

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998 AER, *Preliminary decision Jemena distribution determination 2016 to 2020: Attachment 3–Rate of return*, October 2015, pp. 516–521, 525–538.

999 Incenta Economic Consulting, *Further update on the required return on equity from independent expert reports*, Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon Energy, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, p. 33.

influence of business-specific equity beta estimates. However, the market return may be less comparable to our foundation model return on equity as we would need to consider the extent to which the benchmark efficient entity is exposed to the systematic risks of the market. Partington also noted the need for caution in drawing time-trend inferences from valuation reports, stating:[1000]

> Variation through time, however, needs to be interpreted with caution given our comments about the size of year by year samples below and possible changes in the representativeness of the sample through time.

In any case, we consider that the analysis in our preliminary decision indicated that the market return estimated by the Sharpe-Lintner CAPM using our point estimate of the market risk premium is not inconsistent with the market returns estimated in valuation reports.[1001]

F.5.2 Regression analyses by NERA and HoustonKemp

We do not consider that, on the whole, there is sufficient evidence in the submissions by NERA and HoustonKemp to establish that the return on equity estimates in recent valuation reports support either:

- the use of a risk free rate in excess of the prevailing yield on Australian government securities; or
- an increased market risk premium when the yield on Australian government securities is relatively low (that is, an negative relationship between market risk premium and yields on Australian government securities).

Although we acknowledge that a number of valuation reports have used a risk free rate estimate in excess of the yield on Australian government securities, it is not clear that this is a widespread and persistent practice. As shown in Figure 4.1 of NERA's report and Figure 7 of HoustonKemp's report,[1002] valuer's estimates of the risk free rate have generally been in line with the yield on Australian government securities up until about late 2011. After this time, a considerable number of valuation reports continued to use risk free rate estimates commensurate with Australian government security yields while some valuation reports used risk free rate estimates materially different from these yields.[1003] As noted by Partington & Satchell:[1004]

[1000] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 64.

[1001] In particular in comparison to the market return estimates from valuation reports excluding any adjustment for dividend imputation, which we consider to be the more appropriate series for our purposes (see section E.1.).

[1002] NERA, *The relationship between the market risk premium and risk free rate: evidence from independent expert reports*, a report for United Energy, April 2015, p. 20; HoustonKemp, *The cost of equity: Response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 59.

[1003] HoustonKemp noted that only 25 of the 195 independent valuation reports contained large uplifts to (at least 100 basis points above) the 10 year CGS yield, while 147 of these reports did not contain adjustments to the risk free rate which were greater than 50 basis points (see: HoustonKemp, *The cost of equity: Response to the AER's draft*

> Some of the experts clearly have a view that the risk free rate is substantially above the CGS rate, but on the basis of evidence it cannot be said that this is a consensus view.

We note that HoustonKemp's observation of an uplifted risk free rate (above the CGS yield) by expert reports is largely driven by the use of a 'substantially increased risk free rate by some experts'.[1005]

Partington and Satchell noted that the concern is 'what weighting should be given to each expert firm': based on the number of reports or number of firms.[1006] For example, if we construct the standard error based on the number of reports rather than two observations we form an erroneous belief in the accuracy of our estimates.[1007]

Partington and Satchell advised that 'given the split of expert opinions on whether the risk free rate should be increased or not and given uncertainty over the appropriate weighting of observations, we consider that the case for an increase in the risk free rate is quite weak.'[1008]

Partington and Satchell has noted that it is the difference between the valuers' risk free rate estimates and prevailing yields on Australian government securities that drive the results of NERA's regressions.[1009] They noted that HoustonKemp's analysis faces the same issue.[1010] Partington and Satchell added that HoustonKemp's observation of a negative relationship between the risk free rate and the market risk premium from its regression is 'quite weak' for the following reason:[1011]

> …the relation between the government bond yield and the risk premium used in experts reports is significant in some cases, but only when the NERA or Ernst & Young adjusted estimates of the market risk premium are used and the results

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decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks, January 2016, p. 59).

1004 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 38.

1005 HoustonKemp, *The cost of equity: Response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 60; Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 49.

1006 This is important because two firms write more than 40% of the reports that use a substantially increased risk free rate." Furthermore, if we then construct the standard error based on an assumption of 100 observations (in terms of number of reports) rather than two observations (number of firms) we form an erroneous belief in the accuracy of our estimates. See: Partington and Satchell, Report to the AER: Cost of equity issues–2016 electricity and gas determinations, April 2016, p. 49.

1007 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 49.

1008 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 49.

1009 Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, p. 36.

1010 Partington and Satchell, Report to the AER: Cost of equity issues–2016 electricity and gas determinations, April 2016, p. 50; HoustonKemp, *The cost of equity: Response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 48.

1011 Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp. 49–50.

> are not significant even in these cases for the random effects models and the effect where it is significant is small. We conclude that this evidence is quite weak, the more so when the problem of biased parameters introduced by potentially incorrect weighting is considered.

Partington and Satchell also advised that Houston Kemp's regression actually shows there is:[1012]

> no relation between the risk premium that experts use and the return on ten year bonds. What the expert reports actually show is that post 2010 about half the expert reports use a rate higher than the government bond rate as their proxy for the risk free rate. This is what drives the result in HoustonKemp's report, rather than an increase in the risk premium that the experts were using

We continue to consider, in the first instance, that a valuer's estimate of market risk premium is the valuer's best estimate of the market risk premium. It is not clear that a difference between the valuer's risk free rate estimate and prevailing yields on Australian government securities reflects an uplift to market risk premium, given that the valuer had the opportunity to directly increase its market risk premium estimate.

Further, it is not clear that uplifts separately applied to an initial return on equity or rate of return estimate (in contrast to an increased risk free rate estimate) should be attributed to the market risk premium or market return. In Table 4.2 of its report,[1013] NERA lists the uplifts found in its sample period that it considers are attributable to market-wide factors (rather than firm-specific factors). We note that nine out of the ten uplifts in Table 4.2 are from a single valuer. It is not clear the extent to which these nine uplifts reflect an uplift to the risk free rate ('low interest rates') or market risk premium. The same issue applies to HoustonKemp's report: 13 of the 14 uplifts it considered to be due to market-wide factors were from the same valuer (Grant Samuel).[1014] We are not convinced that reliable inferences can be drawn from such highly-concentrated samples. As noted in Table 3-7, it is not clear that uplifts to the risk free rate reflect efficient financing costs for a benchmark efficient entity.[1015]

[1012] Partington and Satchell, *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, pp. 21–22.

[1013] NERA, *The relationship between the market risk premium and risk free rate: evidence from independent expert reports*, a report for United Energy, April 2015, p. 22.

[1014] HoustonKemp, *The cost of equity: Response to the AER's draft decisions for the Victorian electricity distributors, ActewAGL Distribution and Australian Gas Networks*, January 2016, p. 47.

[1015] See also: Partington & Satchell, *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, pp. 53–55.

G Empirical estimates of equity beta

The equity beta is a key input parameter in the Sharpe–Lintner capital asset pricing model (CAPM). Equity beta measures the sensitivity of an asset or business's returns to movements in the overall market returns (systematic or market risk).[1016]

This appendix focusses on empirical estimates of equity beta. Empirical estimates of equity beta are based on regressions that relate the returns on a set of comparator firms to the return on the market.

As discussed in section 3.4.1, empirical estimates using a comparator set of listed Australian energy network firms from Henry's 2014 report are the main determinants of our equity beta estimate for a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services. Henry's 2014 report is one of a number of Australian empirical studies showing a consistent pattern of equity beta estimates that is robust to the use of different econometric techniques and time periods. We have regard to these other Australian empirical studies. We consider this information supports an equity beta range of 0.4 to 0.7.

We also have regard to empirical estimates of equity beta for international energy firms. However, we place only limited reliance on this evidence as we do not consider the international firms are sufficiently comparable to a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services. We consider this information provides some support for an equity beta point estimate towards the upper end of the range.

This appendix sets out:

- the Australian and international empirical estimates we consider in this decision
- the comparator set we use for our empirical analysis and our reasons for using this comparator set.

G.1 Australian empirical estimates from Henry's 2014 report

For our Australian empirical analysis we commissioned an expert report from Professor Olan Henry (Henry), which provided an update on his 2009 econometric analysis of equity beta.[1017] We consider the evidence presented in Henry's 2014 report in detail because it uses the most recent data and this is relevant in selecting an equity beta (and return on equity) that is reflective of prevailing market conditions.[1018]

1016 McKenzie and Partington, *Risk, asset pricing models and WACC*, June 2013, p. 21; Brealey, Myers, Partington, Robinson, *Principles of Corporate Finance*, McGraw-Hill Australia: First Australian Edition, 2000, p. 187.

1017 Henry, *Estimating β*, April 2009; Henry, *Estimating β: An update*, April 2014.

1018 NER, cll. 6A.6.2(g) and 6.5.2(g); NGR, rule 87(7). It is the most recent AER report.

Henry's 2014 report presented empirical estimates of equity beta for our comparator set of nine Australian energy network firms (see section G.4.1), using available data from 29 May 1992 to 28 June 2013.[1019] Based on our detailed discussion of methodological choices in recent decisions,[1020] we consider the most useful empirical estimates:

- use the Ordinary Least Squares (OLS) estimator (with the Least Absolute Deviation (LAD) estimator used as a robustness check for outliers in the underlying data)
- are measured over multiple estimation periods
- use weekly return intervals (with monthly returns used as a robustness check)
- use the Brealey–Myers formula to de- and re-lever raw[1021] estimates to a benchmark gearing of 60 per cent, although we consider both raw and re-levered estimates
- are based on averages of individual firm estimates and fixed weight portfolios (equal weighting and value weighting)
- do not apply a Blume or Vasicek adjustment.[1022]

We consider the equity beta estimates presented in Henry's empirical analysis support a range of 0.4 to 0.7. Table 3-35 and Table 3-36 set out Henry's re-levered OLS equity beta estimates for the individual comparator firms (averaged across firms) and fixed weight portfolios respectively. The results show that:

- The re-levered individual firm estimates (averaged across firms) range from 0.46 to 0.56. The corresponding raw (that is, observed market gearing level) estimates range from 0.48 to 0.50.[1023]
- The re-levered fixed weight portfolio estimates range from 0.39 to 0.70. The corresponding raw estimates range from 0.42 to 0.58.[1024]

1019 Henry, *Estimating β: An update*, April 2014, p. 9.

1020 See, for example, AER, *Preliminary decision: Jemena Electricity Networks determination 2016 to 2020—Attachment 3: Rate of return*, October 2015, section D.2.2.

1021 Raw equity beta estimates are those that are observed from the initial regression

1022 Henry does not apply a Blume or Vasicek adjustment of any of his estimates, as specified in our terms of reference.

1023 The raw equity beta estimates are those that are observed from the initial regression. They have not been de-levered and re-levered to a benchmark gearing of 60 per cent. These estimates are not presented but can be found at: Henry, *Estimating β: An update*, April 2014, pp. 87–89.

1024 These estimates are not presented but can be found at: Henry, *Estimating β: An update*, April 2014, pp. 90–93.

Table 3-35 Average of re-levered equity beta estimates (individual firm) from Henry's 2014 analysis (OLS, weekly)

Issue	Longest available period	2002 to 2013 (excluding GFC)	Last five years [(a)]
Re-levered OLS estimates	0.52	0.56	0.46

Source: AER analysis; Henry, *Estimating β: An update*, April 2014.

(a) AAN, AGL and GAS were not used for this estimation period because Henry only uses data up to 2006 or 2007 for these firms. See: Henry, *Estimating β: An update*, April 2014, p. 17.

Table 3-36 Re-levered fixed weight portfolio equity beta estimates from Henry's 2014 analysis (OLS, weekly)

	P1	P2	P3	P4	P5
Firms	APA, ENV	AAN, AGL, APA, ENV, GAS	APA, DUE, ENV, HDF, SPN	APA, DUE, ENV, HDF, SKI, SPN	APA, DUE, ENV, SKI, SPN
Equal weighted					
Longest available period[(a)]	0.46	0.52	0.50	0.48	0.39
Longest period available (excl. tech boom & GFC)	0.49	0.52	0.5	0.53	0.45
Value weighted					
Longest available period[(a)]	0.50	0.70	0.44	0.42	0.39
Longest period available (excl. tech boom & GFC)	0.54	0.70	0.52	0.50	0.48

Source: AER analysis; Henry, *Estimating β: An update*, April 2014.

Note: Henry's 2014 report also presented time varying portfolio estimates of equity beta (which range from 0.39 to 0.53, see Henry, *Estimating β: An update*, April 2014, p. 56). We do not place any material reliance on these estimates for reasons discussed in section D.2.2 of Attachment 3 to JEN's preliminary decision.

(a) The longest available period is June 2000–June 2013 for P1; December 2001–October 2006 for P2; December 2005–November 2012 for P3; March 2007–November 2012 for P4; March 2007–June 2013 for P5.

Additionally, Henry's 2014 report presented LAD (weekly) estimates as a robustness check for outliers in the underlying data. He also presented OLS estimates using monthly return intervals as a robustness check of the estimates using weekly return intervals. Henry stated the difference between the re-levered OLS and LAD equity beta estimates are 'almost universally statistically insignificant'.[1025] The results are as follows:[1026]

- the re-levered LAD estimates range from 0.38 to 0.58 and the raw LAD estimates range from 0.31 to 0.60.[1027]
- the OLS estimates using monthly return intervals range from 0.37 to 0.58.[1028]

Henry also performed various robustness and sensitivity tests on the equity beta estimates. These included the Dimson adjustment for thin trading, as well as recursive estimates and the Hansen test for parameter stability and sensitivity. Henry concluded that there is little to no evidence of thin trading across all regression permutations and 'no overwhelming issue with instability'.[1029] Therefore, we are satisfied the estimates presented in Henry's 2014 report are reasonably stable and not significantly affected by thin trading. We also note Associate Professor Graham Partington stated that:[1030]

> A final comment may be made with reference to a number of the reports that allege instability in the estimates of β. Henry (2008, 2009, 2014) provides a range of evidence demonstrating the stability of the estimates.

We consider the equity beta estimates presented in Henry's 2014 report are consistent across a range of different regression permutations, as outlined above. Henry used credible econometric techniques and incorporated robustness checks for data outliers, thin trading and parameter instability in his analysis. Therefore, we have confidence that the equity beta estimate for a benchmark efficient entity falls within the range of 0.4 to 0.7. We also consider Henry's 2014 results indicate a best empirical estimate of approximately 0.5 for a benchmark efficient entity. This is because most of the estimates are clustered around 0.5, as shown in Figure 3-18.

[1025] Henry, *Estimating β: An update*, April 2014, p. 62.

[1026] These equity beta estimates are not presented but can be found at: Henry, *Estimating β: An update*, April 2014, pp. 17–43. We consider fixed weight portfolio estimates (equal weighting and value weighting) and averages of individual firm estimates.

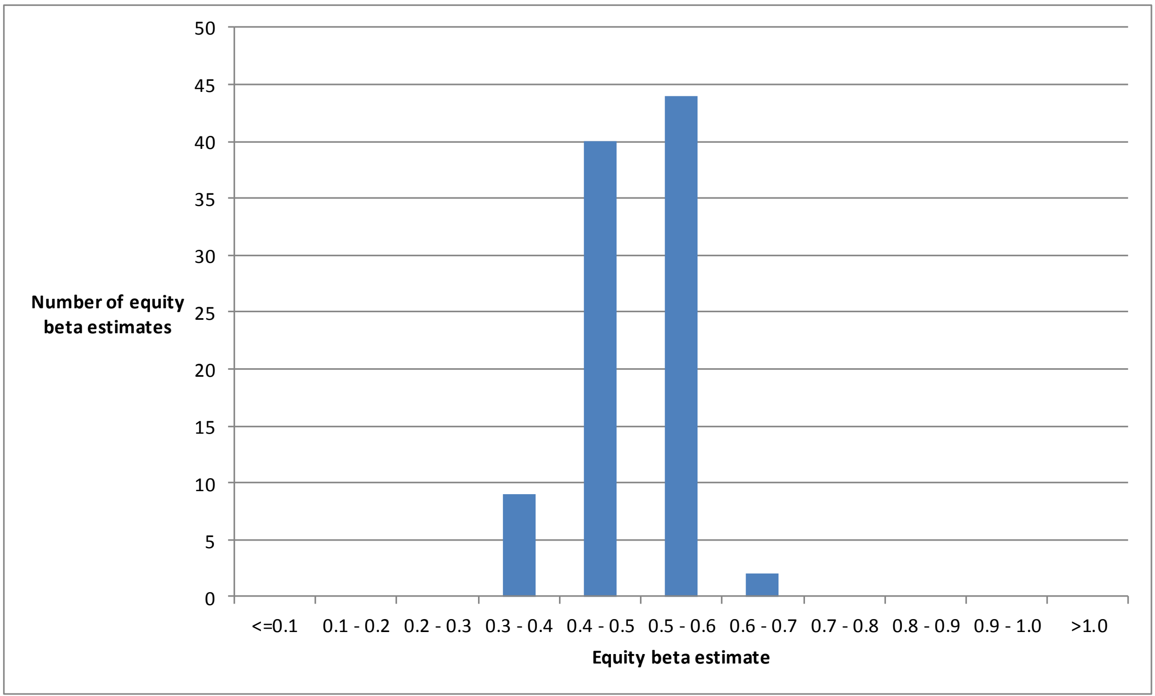
[1027] The raw LAD estimates can be found at: Henry, *Estimating β: An update*, April 2014, pp. 87–89 (for averages of individual firm estimates) and Henry, *Estimating β: An update*, April 2014, pp. 90–93 (for fixed weight portfolio estimates). Henry also presented LAD equity beta estimates for time varying portfolios, and these estimates range from 0.39 to 0.53. See: *Henry, Estimating β: An update*, April 2014, p. 56.

[1028] Henry did not present raw estimates for monthly return intervals. Henry also did not present LAD estimates using monthly return intervals. Henry did present time varying portfolio OLS estimates using monthly return intervals, and these estimates range from 0.39 to 0.47. See: *Henry, Estimating β: An update*, April 2014, p. 58. Henry also suggested that the individual firm estimates based on monthly returns be treated with a degree of caution because some estimates are statistically insignificant. See: *Henry, Estimating β: An update*, April 2014, p. 27.

[1029] Henry, *Estimating β: An update*, April 2014, p. 62. Henry explains that where the Hansen test does show evidence of instability, it is almost uniformly due to a change in the error variance in the regression model. He states that 'there is no evidence of parameter instability associated with the coefficients of the regression models themselves'. However, the Hansen test for equal and value weighted portfolio estimates for P2 (over the longest available period) shows some evidence of parameter instability for beta and should be treated with a degree of caution. See: Henry, *Estimating β: An update*, April 2014, pp. 50–51, 62.

[1030] Partington, *Report to the AER: Return on equity (updated)*, April 2015, p. 22.

Figure 3-18 Equity beta estimates from Henry's 2014 report (average of individual firm estimates and fixed weight portfolio estimates)



Source: AER analysis; Henry, *Estimating β: An update*, April 2014.

Note: This figure contains all averages of individual firm estimates and fixed weight portfolio estimates presented in Henry's 2014 report (95 estimates in total). This includes OLS and LAD estimates, raw and re-levered estimates, weekly and monthly return intervals and all estimation periods.

G.2 Australian empirical estimates from other studies

We consider the equity beta estimates presented in Henry's 2014 report are generally consistent with other empirical studies based on Australian energy network firms, as set out in Table 3-37. These other empirical studies use different econometric techniques and/or comparator sets to our empirical analysis, some of which are not necessarily consistent with our methodological choices.[1031] Nonetheless, the empirical estimates presented give us confidence that there is an extensive pattern of support for an empirical equity beta within a range of 0.4 to 0.7.

[1031] As set out in section D.2.2 of Attachment 3 to JEN's preliminary decision.

Table 3-37 Equity beta estimates for Australian energy network firms

Source	Time period	Individual firm averages	Fixed portfolios	Varying portfolios	Summary of regression permutations
Henry 2014	1992–2013	0.37–0.56	0.31–0.70[(b)]	0.39–0.53	weekly/monthly return intervals, multiple estimation periods, OLS/LAD regressions, value/equal weight fixed portfolios, average/median varying portfolios, raw/re-levered estimates, 9 comparators
Grant Samuel 2014	2009–2014[(c)]	0.42–0.64	n/a	n/a	weekly/monthly return intervals, multiple estimation periods, OLS regressions, Bloomberg adjusted betas, raw estimates, 5 comparators
ERA 2013	2002–2013	0.48–0.52	0.39–0.59	n/a	weekly return intervals, OLS/LAD/MM/TS regressions, value/equal weight fixed portfolios, multiple estimation periods, re-levered estimates, 6 comparators
SFG 2013	2002–2013	0.60	n/a	0.55	OLS regressions, four weekly repeat sampling, Vasicek adjustment, re-levered estimates, 9 comparators
ERA 2012	2002–2011	0.44–0.60	n/a	n/a	weekly/monthly return intervals, OLS/LAD regressions, re-levered estimates, 9 comparators
Henry 2009	2002–2008	0.45–0.71	0.35–0.94[(d)]	0.41–0.78	weekly/monthly return intervals, various estimation periods, OLS/LAD regressions, value/equal weight fixed portfolios, average/median varying portfolios, re-levered estimates, 9 comparators
ACG 2009	1990–2008	0.50–0.58	n/a	0.69–0.91	monthly return intervals, OLS/LAD regressions, multiple estimation periods, raw/re-levered estimates, average/median varying portfolios, 9 comparators
Henry 2008	2002–2008	0.35–0.67	0.31–0.77[(e)]	n/a	daily/weekly/monthly return intervals, discrete/continuous returns, various estimation periods, OLS/LAD regressions, value/equal weight portfolios, raw/re-levered estimates, no adjustment/Vasicek/Blume, 10 comparators

Source: AER analysis.[1032]

(a) We place no material reliance on the estimates from time varying portfolios as they are not grounded in financial theory and are prone to measurement error. See: Henry, *Estimating β: An update*, April 2014, p. 52.

[1032] Based on the following reports: ACG, *Empirical evidence on proxy beta values for regulated gas transmission activities: final report*, July 2002, pp. 35, 39–40; Henry, *Econometric advice and beta estimation*, November 2008; ACG, *Australian Energy Regulator's draft conclusions on the weighted average cost of capital parameters: commentary on the AER's analysis of the equity beta*, January 2009, pp. 22, 25; Henry, *Estimating β*, April 2009; ERA, D*raft decision on proposed revisions to the access arrangement for the Western Power network*, March 2012, pp. 202, 204; SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, pp. 12–15; ERA, *Explanatory statement for the rate of return guidelines*, December 2013, pp. 171, 173; Grant Samuel and Associates, *Envestra financial services guide and independent expert's report (appendix 3)*, March 2014, p. 6; Henry, *Estimating β: an update*, April 2014.

(b) 0.31 is a raw LAD estimate, which we place less reliance on. The minimum re-levered LAD estimate is 0.38 and the minimum OLS estimate is 0.39.

(c) Grant Samuel uses equity beta estimates from the Australian Graduate School of Management (AGSM) and Bloomberg. This time period reflects AGSM's estimation, which uses a four year estimation period as at September 2013, and Bloomberg, which uses a four year estimation period as at February 2014.

(d) 0.94 is an LAD estimate based on a portfolio with only 18 monthly observations. If this portfolio is excluded the maximum estimate is 0.75, which is again an LAD estimate (which we place less reliance on). The maximum OLS estimate is 0.62.

(e) 0.31 is an LAD estimate, which we place less reliance on. The minimum OLS estimate is 0.42. 0.77 is a Blume–adjusted estimate, which we do not rely on. The maximum unadjusted estimate is 0.68, and the maximum OLS estimate is 0.66.

(f) ACG did not make it clear what time period its data covered. However, it noted that equity beta estimates were only used where there were more than 20 observations.

G.3 International empirical estimates

The international empirical estimates we consider in this decision are set out in Table 3-38 and range from 0.3 to 1.0.[1033] We consider this evidence provides some limited support for an equity beta point estimate towards the upper end of our empirical range. We do not include these firms in our comparator set (for our primary empirical analysis) because we do not consider they are sufficiently comparable to a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services (see section G.4.3).

Table 3-38 International empirical estimates of equity beta

Report	Details	Raw estimate	Re-levered estimate (to 60 per cent gearing)
SFG, *Regression-based estimates of risk parameters*, June 2013, pp. 15, 19 CEG, *Information on equity beta from US companies*, June 2013	The CEG report prepared as a part of the ENA submission to the Guideline process suggested a sample of 56 US–listed energy network companies to be included in our comparator set of Australian–listed energy network firms. Based on the comparator sample provided by CEG, SFG computed OLS equity beta estimates over an 11 year period from 2 January 2002 to 19 November 2012. SFG's results incorporate a Vasicek adjustment to its OLS equity beta estimates.	0.68—average of individual firm estimates (0.67 without a Vasicek adjustment)	0.88—average of individual firm estimates 0.91—average equity beta of an equal–weighted index of firm returns[1034]

[1033] This range includes raw and re-levered equity beta estimates. The re-levered estimates presented have been calculated using the Brealey-Myers formula set out in our recent decisions (see, for example, AER, *Preliminary decision: Jemena Electricity Networks determination 2016 to 2020—Attachment 3: Rate of return*, October 2015, section D.2.2). Also, the studies we consider in this section are largely the same as those considered in our recent decisions.

[1034] SFG defines its equal weighted index as an index of firm returns, which allows it to 'construct one time series in each market that is available over the entire 11 year period'. See: SFG, *Regression-based estimates of risk parameters*, June 2013, p. 2.

Damodaran, *Updated data: The Data page, Levered and Unlevered Betas by Industry: Download detail*, Stern school of Business New York University, last updated 5 January 2016, viewed 18 March 2016	The Damodaran equity beta estimates for US industry groups have been updated for 2015 market data. However, Damodaran has changed his industry classifications since 2013. The only industry that reports energy network firms is 'Utility (general)'. It contains electricity and gas network businesses, as well as vertically integrated businesses. Damodaran uses OLS estimation, weekly return intervals and a five year estimation period (up to 2015 year–end).	0.55	0.81*
FTI Consulting, *Cost of capital study for the RIIO-T1 and GD1 price controls*, July 2012, p. 42	This report for Ofgem provided equity beta estimates for three UK–listed energy network firms. FTI Consulting used OLS estimation, daily return intervals and calculated the average daily returns for the sector as the market–capitalisation weighted average of the returns for National Grid, Scottish and Southern Energy and Scottish Power.	0.45—over 10 May 2011 to 9 May 2012 0.48—over 10 May 2010 to 9 May 2012	We are not able to provide re-levered equity beta estimates because the report does not provide the appropriate gearing data.
Alberta Utilities Commission, *2013 Generic Cost of Capital*, 23 March 2015, pp. 1, 24–26	This 2013 Generic Cost of Capital report sets out the AUC's approved return on equity for several utilities for the years 2013, 2014, and 2015. The AUC considered advice from the following experts on the equity beta based on estimates of Canadian utilities: • Dr Sean Cleary of Queens University recommended an equity beta range of 0.3 to 0.6. He calculated an average beta of 0.29 using monthly returns over the 1988–2012 period. He also calculated an average beta of 0.25 using 60 months of returns up to 20 December 2013. • Dr Laurence Booth of the University of Toronto recommended an equity beta range of 0.45 to 0.55 for Canadian stand-alone utilities based on long run beta estimates. • Ms Kathleen McShane (president and senior consultant with Foster Associates Inc.) was critical of historical equity betas, but used beta estimates from Bloomberg and Value Line. These betas range from 0.65 to 0.7. These betas also incorporate an adjustment towards 1.0 (Blume or Vasicek).	0.3–0.7	This report did not specify whether the equity betas were raw or re-levered to a benchmark gearing.
PwC, *Appreciating Value New Zealand, Edition six*, March 2015, p. 20 (See also: http://www.pwc.co.nz/appreciating-value/pwc-wacc-formula)	An annual report on the cost of capital (and equity beta) for a number of New Zealand companies classified by industry. The equity beta estimates are based on an average of monthly returns over (up to) five years for two comparable firms (Horizon Energy Distribution Limited and Vector Limited). PwC's March 2015 report presents estimates as at 31 December 2014.	0.6—average of individual form estimates	0.88—average of individual firm estimates*
The Brattle Group, *The WACC for the Dutch TSOs, DSOs,*	This report for the Netherlands Competition Authority estimated equity beta for a set of seven European and three US energy network firms. It used a three	0.58—average of European individual firm	0.71—average of European individual firm

water companies and the Dutch pilotage organisation, March 2013, pp. 16–18	year estimation period and daily return intervals. In response to CEG's concerns, we have used the Dimson beta where the adjustment is significant.[1035]	estimates 0.60—average of US individual firm estimates 0.58—average of European and US individual firm estimates	estimates* 1.01—average of US individual firm estimates* 0.80—average of European and US individual firm estimates*

Notes: * We have de-levered and re-levered these raw equity beta estimates.

G.4 Choice of comparator set

Since 2014, we have received numerous submissions from service providers (and their consultants) expressing concern over the reliability of Henry's (2014) equity beta estimates.[1036] These concerns flow from their view that our comparator set of Australian energy network firms is too small to produce reliable equity beta estimates. These service providers and their consultants submitted that:

- equity beta estimates based on this comparator set are imprecise and unstable
- the estimates could be improved by including international energy firms in the comparator set
- the estimates could be improved by including Australian non-energy infrastructure firms in the comparator set—partly because they consider our comparator set should not be restricted to regulated energy network firms.[1037]

We responded to many of these submissions in detail in our recent decisions.[1038] However, we reproduce our key conclusions in sections G.4.2, G.4.3, and G.4.4, in response to new submissions and analysis.

Ultimately, we consider there is a trade-off between the increased statistical precision from a larger comparator set and the comparability of the firms in the comparator set to a benchmark efficient entity with a similar degree of risk as JEN in providing regulated

1035 See: CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 37.

1036 See, for example, SFG, *Equity beta*, May 2014, pp. 2–3; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 84–85; CEG, *WACC estimates*, May 2014, pp. 7–10; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 4, 10–12; SFG, *The required return on equity for the benchmark efficient entity*, February 2015, pp. 19–20; CEG, *Estimating the cost of equity, equity beta and MRP, January 2015*, pp. 33–34; Frontier Economics, *Key issues in estimating the return on equity for the benchmark efficient entity*, June 2015, pp. 47–48, 50–51; Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 2–3; Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, pp. 39–40, 42–44.

1037 Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 20–25, 34.

1038 See, for example, sections D.2.1 and D.2.3 of Attachment 3 to our preliminary decision for JEN. In these decisions we also responded to submissions from other stakeholders that suggested the equity beta estimates in Henry's 2014 report cluster around a range of 0.3 to 0.5.

services.[1039] This necessarily requires a degree of regulatory judgement in determining a reasonable comparator set. We are satisfied, at this time, that our comparator set is sufficiently reflective of a benchmark efficient entity, given this trade-off. We are also satisfied, at this time, that our comparator set produces reliable equity beta estimates.

G.4.1 Comparator set for Australian empirical analysis

We define a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services as 'a pure play, regulated energy network business operating within Australia'.[1040] We would, ideally, use firms that share all or most of the key characteristics of this benchmark efficient entity when conducting our regression analysis to estimate the equity beta. In practice, few firms would fully reflect this benchmark. Therefore we use market data for domestic businesses that are considered to be reasonable comparators to the benchmark efficient entity to inform the equity beta estimate.

In the Guideline we identified nine firms that may be considered as reasonable comparators to a benchmark efficient entity (as we have defined it), and these remain relevant. They are ASX listed firms that provide regulated electricity and/or gas network services and are operating within Australia. Table 3-39 sets out the details of these nine firms.[1041]

It is important to note that three of these firms were no longer trading by June 2013. Another firm, AGL Energy Limited, has changed its operations such that it no longer closely represents a benchmark efficient entity.[1042] We account for this by only including data over an applicable time period for these four firms. Whereas, for the other five firms, we consider the most recent data (up to 28 June 2013).[1043] We note that Envestra Ltd was delisted on 17 October 2014.[1044]

Table 3-39 Listed entities providing regulated electricity and gas network services operating in Australia

Firm (ASX ticker)	Time / trading period	Sectors
AGL Energy Limited (AGK)	January 1990 – October 2006	Electricity, Gas
Alinta (AAN)	October 2000 – August 2007	Gas

1039 Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, p. 11.

1040 AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 8, 33–36, 44–45.

1041 SFG used the same Australian energy network firms in its comparator set of Australian (and US energy) firms (see SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, p. 9).

1042 In October 2006, AGL sold its infrastructure and asset management business to Alinta and acquired a portion of Alinta's retail and co-generation businesses.

1043 Henry, ***Estimating β: An update***, April 2014, p. 12.

1044 See: http://www.asx.com.au/asx/statistics/announcements.do?by=asxCode&asxCode=ENV&timeframe=Y&year=2014.

APA Group (APA)	June 2000 – present	Gas, Minority interest in other energy infrastructure
DUET Group (DUE)	August 2004 – present	Electricity, Gas
Envestra Ltd. (ENV)	August 1997 – October 2014	Gas
GasNet (GAS)	December 2001 – November 2006	Gas
Hastings Diversified Utilities Fund (HDF)	December 2004– November 2012	Gas
Spark Infrastructure Group (SKI)	March 2007[1045] – present	Electricity, Gas
AusNet Services (AST), formerly SP AusNet (SPN)	December 2005 – present	Electricity, Gas

Source: AER analysis; Bloomberg; AER, *Review of the WACC parameters: Final decision*, May 2009, p. 255.

While we consider the firms in Table 3-39 are reasonably comparable to a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services, they differ to some degree as they provide some non–regulated electricity and/or gas services and this may affect their risk profile. Examples of this include:

- Approximately 21 per cent of APA Group's revenue in the 2015 financial year (excluding pass–through revenue) was subject to prices determined under full regulation. APA generates a large part of the remaining 79 per cent of its revenue from contracts which have set terms, including negotiated pricing for the life of the contract.[1046]
- DUET Group's assets receive limited unregulated revenue—Dampier Bunbury Pipeline (4 per cent unregulated), United Energy (8 per cent unregulated), Multinet Gas (5 per cent unregulated) in the 2015 financial year.[1047]
- Approximately 86 per cent of AusNet Services' revenues are regulated, as at 29 May 2015.[1048]
- Hastings Diversified Utilities Fund (HDF) had investments in three gas pipelines and South East Water, a UK water utility (although it divested its interest in this utility in December 2010). The Pilbara Pipeline System is unregulated. Regulatory coverage of the Moomba to Adelaide pipeline was revoked in September 2007 and ceased to apply for the South West Queensland pipeline in 2008.[1049]

[1045] The SKI data is available from December 2005, but the data prior to March 2007 reflects stapled securities traded as instalment receipts—these instalments requires further leverage adjustment and makes beta estimation difficult.

[1046] APA Group, *Annual report 2015: Connecting markets creating opportunities*, pp. 7, 18.

[1047] DUET Group, *Annual report 2015*, p. 3.

[1048] AusNet Services, *Statutory annual report 2015*, p. 22.

[1049] HDF, *Annual report 2011*, pp. 2, 10; AEMC, *WA: Pilbara Pipeline System*, viewed 7 November 2014, see link <http://www.aemc.gov.au/Energy-Rules/National-gas-rules/Gas-scheme-register/WA-Pilbara-Pipeline-System>; AER, *Moomba to Adelaide pipeline—Access arrangement 2006–10*, viewed 7 November 2014, see link http://www.aer.gov.au/node/5453; AER, *Epic Energy south west Queensland pipeline—Access arrangement 2006–08*, viewed 7 November 2014, see link http://www.aer.gov.au/node/5219.

- While GasNet earned the majority of its revenue from tariffs charged on its regulated assets, a contribution to its earnings for the 2005 financial year was also provided by specialised engineering and project management services.[1050]

Generally, with the exception of APA Group and HDF, these non–regulated activities only constitute a small portion of the revenue earned by the firms in this comparator set. Therefore, when we consider the impact of these unregulated activities, we expect the net impact would be sufficiently minor such that our equity beta estimates for the comparators are reasonable and reflect an entity that has a similar degree of risk in the provision of regulated services as JEN.[1051] If unregulated activities were to have a non–minor impact on the comparator firms' equity beta estimates, we consider it would more likely overstate than understate the 'true' equity beta because unregulated activities are likely to result in greater systematic risk for the firm.[1052]

G.4.2 Precision and stability of Australian empirical estimates

We do not consider our empirical equity beta estimates of listed Australian energy businesses are unreliable. The service providers' consultants appear to have taken a narrow definition of what is reliable in this context. They measure reliability by considering precision and stability of equity beta estimates over time.[1053] They find that these statistical properties improve as the comparator set increases.[1054] However, a larger dataset is not an end in itself. Decreasing the dispersion of estimates by increasing the size of the comparator set may not be helpful if that comparator set is less representative of what we are trying to estimate. In such cases, the mean that the estimates are clustered around will be less representative of the 'true' equity beta (that is, biased). We do not consider this constitutes reliability. We agree with Associate Professor Graham Partington and Professor Stephen Satchell's (Partington and Satchell's) statement that, 'The critical issue is how appropriate are the additional firms selected as comparators and how much improvement is obtained'.[1055]

[1050] GasNet, *Infrastructure for generations: GasNet Australia Group annual report 2005*, p. 29.

[1051] We understand that the organisational structure and commercial activities of these comparator firms are subject to change. Consequently, we will continuously review our comparator set in case we need to make adjustments. This may entail adjusting the comparator set by excluding or adding new comparators.

[1052] Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, pp. 3–4.

[1053] See, for example, Frontier, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 13–19; SFG, *Beta and the Black capital asset pricing model*, February 2015, pp. 10–11; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 33–34; CEG, *WACC estimates*, May 2014, pp. 7–10; SFG, *Equity beta*, May 2014, pp. 3–4, 13–15, 28–31. In its 2014 report, SFG considered the dispersion of equity beta estimates. It measures dispersion as the standard deviation of individual firm equity beta estimates, relative to the mean of the sample (of equity beta estimates) (see: Brooks, Diamond, Gray and Hall, *Assessing the reliability of regression-based estimates of risk*, June 2013, p. 5).

[1054] See, for example, Frontier, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 34; CEG, *WACC estimates*, May 2014, pp. 7–10; SFG, *Equity beta*, May 2014, p. 13.

[1055] Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, p. 11.

It is also useful to note that Henry performed a separate time series regression for each comparator firm and various portfolios of comparator firms.[1056] The weekly returns for each firm are regressed against the weekly returns on the market over a period of time (the estimation period).[1057] This means that the number of observations, or sample size, relevant to the statistical analysis of the individual equity beta estimates is the number of weekly return intervals in the estimation period. In Henry's 2014 report this sample size ranges from 229 (last five years, HDF) to 826 (longest period available, ENV) observations.[1058] In addition, we place most reliance on averages of individual firm estimates and fixed weight portfolio estimates, which cluster around 0.5 (see Figure 3-18). This focus on average and portfolio equity beta estimates further reduces any residual uncertainty associated with individual firm estimates.

Frontier Economics submitted graphs of 10 year rolling beta estimates with confidence interval bands to provide support for its view that empirical equity beta estimates based only on Australian energy network firms are imprecise and unstable.[1059] We have assessed this material and consider it is, in substance, the same evidence that has been previously submitted to us on this issue.[1060] Nevertheless, Partington and Satchell have analysed the graphs of 10 year rolling beta estimates.[1061] They conclude that:[1062]

> … for the portfolio estimates of beta, any improvements in the precision of the estimates appear to be modest as are any improvements in stability. Since portfolio estimates would be our preferred way to estimate an industry beta, we conclude that the improved statistical properties are modest and come at the cost of potentially biased estimates from comparators that may be inappropriate.
>
> .... and in the time series of rolling portfolio beta estimates the US betas appear to be less stable than the Australian betas.

Frontier Economics also considered it is unsurprising that our estimates tend to cluster together because they are effectively a regurgitation of the same estimate, based on slight variations of the same dataset.[1063] We disagree with this view. Our estimates are

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1056 Henry, *Estimating β: An update*, April 2014.

1057 We also measure returns over monthly intervals. The sample size for monthly return intervals ranges from 51 to 190 observations. See: Henry, *Estimating β: An update*, April 2014, pp. 23–26.

1058 Henry, *Estimating β: An update*, April 2014, pp. 17, 21.

1059 Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 13–19.

1060 For example, the precision and stability of equity beta estimates based on Australian energy network firms has been discussed in SFG, *Equity beta*, May 2014, pp. 3–4, 13–15, 28–31; Brooks, Diamond, Gray and Hall, *Assessing the reliability of regression-based estimates of risk*, June 2013, pp. 2, 9–15; and SFG, *Beta and the Black capital asset pricing model*, February 2015, pp. 10–11.

1061 Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, pp. 11–12, 15.

1062 Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, p. 15.

1063 Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 17–18.

based on data from a comparator set of Australian energy network firms because we consider these firms are most reflective of a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services. It is well known that estimates can vary based on changes in the estimation method or period, or variations to the dataset (such as the construction of different portfolios). This is why empirical analyses include sensitivity and/or robustness checks based on such variations.[1064] Even Frontier performs regressions based on a five year estimation period as a robustness check on its estimates from a 10 year estimation period.[1065] We do not consider the robustness of our equity beta estimates to different estimation choices is invalidated by the fact that the estimates are based on the same underlying comparator set of firms (or a subset of these firms).

Based on the available evidence and submissions, we do not consider our Australian empirical equity beta estimates are unreliable. We consider the data from our comparator set of Australian energy network firms is sufficient for us to form an equity beta estimate that will contribute to the achievement of the allowed rate of return objective.[1066] This comparator set is reflective of a benchmark efficient entity and generates a consistent pattern of empirical equity beta estimates that is robust across econometric techniques, time periods and different combinations of comparator firms. This is demonstrated in sections G.1 and G.2.

G.4.3 Use of international energy firms

We have had regard to all available domestic comparators. Ideally, we would have further reasonable domestic comparators to include. However, we consider that the comparators we use are the most relevant and useful for our empirical analysis, given we are looking to ascertain the efficient financing costs of a benchmark efficient entity with a similar degree of risk as JEN in relation to the provision of its regulated services. We do not include international energy network firms in our comparator set for empirical analysis. We consider international energy firms are not suitable comparators in this case, for the following reasons:

- They deviate from our definition of a benchmark efficient entity definition because they do not operate within Australia. Differences in regulation of businesses, the domestic economy, geography, business cycles, weather and a number of different factors are likely to result in differences between equity beta estimates for similar businesses between countries.[1067] It is difficult to assign quantitative impacts to these qualitative factors.

1064 For example, SFG states that, 'Because there are so many methodological choices to be made, it is common practice to consider the sensitivity of beta estimates to the different choices that might be made.' (see SFG, *Equity beta*, May 2014, p. 9).

1065 Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 7.

1066 NER, cll. 6.5.2(f) and 6A.6.2(f); NGR, rule 87(6).

1067 This is supported by Partington and Satchell. See Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, p. 11. They stated, 'Considerable caution in reaching conclusions about beta needs to be exercised when the comparators are drawn from overseas countries. This is

- We discuss equity beta estimates in the context of our foundation model, which is the domestic Sharpe-Lintner CAPM.[1068] This provides a strong rationale for estimating the equity beta using Australian data. If we included international energy firms in our comparator set, it may be more appropriate to use an international or global CAPM.[1069]
- Equity beta estimates from international comparators are measured with respect to the market portfolio of their home market.[1070] This means the equity beta estimates from international comparators are not a measurement of the firm's systematic risk relative to the Australian domestic market portfolio.[1071] As Associate Professor John Handley (Handley) stated:[1072]

> In general, domestic betas and international betas measure different things and are not comparable due to potential differences in the covariance structure and level of systematic risk in the respective markets. This is purely a definitional difference.

- They may not have the same structure as Australian energy network firms. For example, a number of US comparator businesses identified by the Competition Economists Group (CEG) are vertically integrated.[1073] They engage in energy generation, wholesale and retail of energy, as well as other activities distinct from energy distribution and transmission. Some of the firms even engage in telecommunications, real estate development and manufacturing activities.[1074] These activities are very different from our definition of a benchmark efficient entity, which is a pure play regulated energy network business (operating within Australia). As noted in the Guideline, we consider vertically integrated firms tend to have higher equity beta estimates than pure play energy network firms.[1075]

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because of differences in industry structure, technology, the nature of competition, the economic environment and regulatory and tax systems'.

1068 We implement the Sharpe-Lintner CAPM under the assumption of a domestic market, but with a presence of foreign investors. This allows us to recognise that foreign investors cannot utilise imputation credits. However, the benchmark efficient entity operates in the Australian market by definition, and we estimate the MRP in the context of the Australian market portfolio.

1069 See Handley, *Advice on the return on equity*, October 2014, p. 24; Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, p. 16.

1070 This is the case unless the equity betas are estimated using an international CAPM framework.

1071 This is supported by Handley and Partington and Satchell. See Handley, *Advice on the return on equity*, October 2014, pp. 23–24; Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, p. 16. In his May 2015 report, Handley concluded that he does not consider it necessary to change any of the findings in his earlier (2014) report. See: Handley, *Advice on the rate of return for the 2015 AER energy network determination for Jemena Gas Networks*, 20 May 2015, p. 28.

1072 Handley, *Advice on the return on equity*, October 2014, p. 23.

1073 CEG describes vertically integrated US energy utility firms as 'common among [its] sample'. See: CEG, *Information on equity beta from US companies*, June 2013, p. 20.

1074 CEG, *Information on equity beta from US companies*, June 2013, pp. 47–68.

1075 In the rate of return guideline, we found the average equity beta of 56 US energy utilities (identified by CEG) was greater than the average equity beta of 18 US utilities identified by ACG as 'almost exclusively electricity and/or gas distribution and transmission businesses'. See: AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 62–63. Also see: ACG, *Beta for regulated electricity transmission and*

- We consider the available Australian data is sufficient for us to form a reasonable equity beta range that is reflective of the equity beta for a benchmark efficient entity.

These factors are discussed in more detail in the Guideline and 2009 WACC review.[1076] Based on the above reasoning, we consider it is a suboptimal outcome to use a foreign proxy (or proxies) to estimate the equity beta for a domestic benchmark. It should only be used where there is evidence that this will produce more reliable estimates of the domestic equity beta than the Australian estimates themselves. We do not consider the material submitted by the relevant service providers present us with such evidence.

The service providers' consultants appear to recognise international energy network firms are less comparable to a benchmark efficient entity than Australian energy network firms. However, they also consider our comparator set of Australian energy network firms is too small and produces unreliable equity beta estimates.[1077] In analysing these competing considerations, the service providers and their consultants concluded that the 56 US energy firms identified by CEG during the Guideline process are sufficiently comparable to a benchmark efficient entity. Therefore, they should be included in our comparator set for empirical analysis, albeit with less weight than the domestic comparators.[1078]

We do not consider the service providers currently under assessment have provided satisfactory evidence that the suggested sample of 56 US energy firms are sufficiently comparable to a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services.[1079] Handley supports this view.[1080] We provided detailed reasoning for this view in our recent decisions, which we do not reproduce in this decision but which remains applicable.[1081] However, Partington and Satchell have

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distribution: Report to Energy Network Association, Grid Australia and APIA, September 2008, p. 18; CEG, *Information on equity beta from US companies*, June 2013; SFG, *Regression-based estimates of risk parameters*, June 2013, p. 19.

1076 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 59–64. AER, AER, *Review of WACC parameters: Final decision*, May 2009, pp. 261.

1077 SFG, *Equity beta*, May 2014, p. 28–31; CEG, *WACC estimates*, May 2014, pp. 7–10; SFG, *Beta and the Black capital asset pricing model*, February 2015, pp. 10–12; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 33–34; Frontier, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 13–19.

1078 SFG, *Equity beta*, May 2014, pp. 31–34, 40; CEG, *WACC estimates*, May 2014, pp. 8–10; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 33–34; Frontier, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 29–31; Frontier Economics, *The required return on equity under a foundation model approach*, January 2016, p. 44.

1079 Nor do we consider our Australian empirical equity beta estimates are unreliable (see section G.4.2).

1080 Handley, *Advice on the return on equity*, October 2014, pp. 23–24.

1081 See, for example, AER, *Preliminary decision: Jemena Electricity Networks determination 2016 to 2020—Attachment 3: Rate of return*, October 2015, section D.2.1 (under the heading 'International comparators').

assessed Frontier Economics' most recent (2016) report on the issue, and conclude that:[1082]

> … the case that the samples are homogeneous has not been made…Indeed on the basis of Frontier's analysis of the means for weekly betas the US comparators are inappropriate
>
> …Furthermore, the use of 24% by weight of Australian data and 76% by weight of US data to compute an Australian beta seems intuitively inappropriate.
>
> …The notion that Beta is a measure independent of the index used, and hence can be aggregated across different countries troubles us. The usual way this would be addressed is to build a global CAPM and compute betas with respect to a world portfolio, or regard the USA and Australia as a single region and define a new market portfolio based on the capitalisation weighted aggregate of the two markets.

We also received submissions in 2015 from other stakeholders that do not support the inclusion of international energy firms in our domestic comparator set. For example, Origin supported our decision to use a comparator set of Australian energy network firms.[1083] It considered international comparators should not be used as primary determinants of risk to the extent that the risks faced by these firms are not directly comparable to Australian conditions. The Consumer Challenge Panel also disagreed with the inclusion of 56 US energy firms in our Australian comparator set.[1084]

This does not imply that the empirical evidence based on international energy network firms should be discarded completely. Rather, we consider that such evidence may have some use in informing the equity beta point estimate from within the range derived using Australian empirical estimates. Further, we consider it useful to examine evidence on many available international energy network firms, rather than only those based in the US.

G.4.4 Use of non-energy infrastructure firms

In its 2016 report, Frontier Economics (previously SFG) submitted that we should include Australian non-energy infrastructure firms in our comparator set in addition to Australian energy firms.[1085] Frontier Economics examined equity beta estimates for nine Australian energy network firms, seven Australian non-energy infrastructure

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[1082] Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, pp. 15–16.

[1083] See, for example, Origin Energy*, Submission to Victorian electricity distributors regulatory proposals*, 3 July 2015, pp. 10–11. Also see QCOSS, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 78.

[1084] CCP3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period*, August 2015, pp. 70–71.

[1085] Frontier Economics also proposed international energy firms be included. See: Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 2–3.

firms[1086] and 56 US energy firms. It concluded that the expanded comparator set has better statistical properties (precision and stability) than our comparator set based on Australian energy network firms.[1087]

We have had regard to all available domestic comparators. Ideally, we would have further reasonable domestic comparators to include. However, we consider that the comparators we use are the most relevant and useful for our empirical analysis, given we are looking to ascertain the efficient financing costs of a benchmark efficient entity with a similar degree of risk as JEN in relation to the provision of its regulated services. We do not include non-energy infrastructure firms in our comparator set for empirical analysis. We consider these firms are not suitable comparators in this case, for the following reasons:

- The allowed rate of return objective requires us to consider the efficient financing costs of a benchmark efficient entity with a similar degree of risk as JEN in the provision of regulated electricity network services. These firms do not provide electricity network, or more generally energy network, services.
- Differences in regulation (including minimal or no regulation), industry structure and consumer demand for non-energy infrastructure firms are likely to result in different risk profiles relative to energy network firms regulated under the rules and law.[1088] For example, a number of Australian non-energy infrastructure firms are unregulated or are partly regulated under different regulatory regimes.[1089] We explain why we consider unregulated businesses are likely to have a very different risk profile to regulated firms in section 3.3.3. Also, a number of Australian non-energy infrastructure firms provide a range of different services in addition to management of and access to the monopoly infrastructure,[1090] which are likely to influence their overall risk profile.
- We consider the available data for Australian energy network firms are sufficient for us to form a reasonable equity beta range that is reflective of the equity beta for a benchmark efficient entity.

1086 Although it excluded two of these from its analysis because they have been engaged in merger activity (see Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 21).

1087 Specifically, Frontier considered the average and portfolio estimates (10 year rolling beta estimates) are more stable over time and have tighter confidence intervals (see Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 24–25, 31–33). We respond to this in section G.4.2.

1088 That is, the National Electricity Law and Rules, and the National Gas Law and Rules.

1089 For example, Sydney Airport and Transurban are listed infrastructure firms that are not subject to direct price/revenue regulation. Sydney Airport is subject only to price and quality monitoring by the ACCC (see Department of Infrastructure and Regional Development, *Economic regulation*, last updated 12 June 2014, viewed 23 February 2016, https://infrastructure.gov.au/aviation/airport/airport_economic_regulation/economic_regulation.aspx). 79% of Transurban's assets are concession assets, 'representing the provision by Government entities for the right to toll customers for the use of the assets' (see Transurban, *2015 Transurban annual report* (for the year ended 30 June 2015), p. 11). Both of these types of regulation are very different to direct price/revenue cap regulation.

1090 For example, Telstra provides a range of services, categorised into segments such as Telstra Retail, Global Enterprise and Services, Telstra Wholesale and Telstra Operations. See Telstra, *Our brilliant connected future: Telstra annual report 2015*, pp. 21–22.

As discussed at the start of section G.4.2, our view is that while increased statistical precision and/or stability is desirable, it is not preferable if the resulting estimates are substantially less reflective of the 'true' equity beta for a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services.

Frontier Economics performed two statistical tests (the Kolmogorov-Smirnov test and a t-test)[1091] to infer that the three comparator sets are drawn from the same population.[1092] However, we do not consider these tests show that the comparator sets are drawn from the same underlying population. Partington and Satchell consider both tests have been incorrectly applied. They advise:[1093]

> Frontier(2016a) use the Kolmogorov-Smirnov (KS) test which compares two distribution functions, but Frontier's analysis is based on estimated parameters being used as the parameters of the distribution functions. It is known that the critical values of the KS test assume no unknown parameters; that is, they are based on the two empirical distribution functions, and will, consequently, be wrong for the problem being considered by Frontier. Generally, Monte Carlo analysis is necessary.

Partington and Satchell also consider there are test specification issues with Frontier Economics' application of the t-test (that is, it may lead to upward bias) and that small sample sizes were used for the tests. They consider:[1094]

> Inappropriate application, or low power, of the tests, is likely to explain why despite the appearance of quite different distributions of beta for the AER sample and other listed Australian Infrastructure firms (see Frontier 2016a, Figure 4 reproduced below) the statistical tests fail to reject the null hypothesis of no difference between the beta estimates for the two groups.

Finally, Partington and Satchell show Frontier Economics misinterpret the results of their own analysis comparing the weekly equity beta estimates for the US and Australian comparator sets.[1095] Frontier Economics conclude the result is borderline when, based on tis reported statistics, the null hypothesis is rejected.[1096]

Moreover, CEG and SFG provided analysis on the comparability of 56 US energy firms to a (domestic) benchmark efficient entity. We analysed this material and explained in detail why we consider international energy firms are not reasonably comparable to a

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[1091] The Kolmogorov-Smirnov test tests whether two samples have the same distribution function; and the t-test tests whether two samples come from populations that have the same mean. See Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 7.

[1092] Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, pp. 22–24, 29–31.

[1093] Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, p. 13.

[1094] Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, pp. 13–14.

[1095] Partington and Satchell, *Report to the AER: Cost of equity issues 2016 electricity and gas determinations*, April 2016, p. 15.

[1096] Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 31 (Table 11).

benchmark efficient entity with a similar degree of risk as JEN in providing regulated services (see section G.4.3). However, we have received little analysis (outside of the above statistical tests) on the comparability of the seven Australian non-energy infrastructure firms used in Frontier Economics' report to a benchmark efficient entity with a similar degree of risk as JEN in providing regulated services. Frontier Economics simply chose the listed firms that were identified as 'infrastructure firms' in the Osiris database, with a sufficient history of available stock returns data and with a majority of operations within Australia.[1097]

We disagree with the suggestion by several service providers that a benchmark efficient entity should be defined as an unregulated entity operating in a workably competitive market (see Table 3-6). However, we note in any case that we do not consider there is persuasive evidence that these entities are reasonable comparators for a benchmark efficient entity with similar degree of risk to JEN in the provision of its regulated services.

We note that Frontier Economics, despite recommending the use of non-energy infrastructure comparators, proposed its original equity beta estimate of 0.82, which does not include non-energy infrastructure comparators.[1098] We also note that, currently, the use of non-energy infrastructure firms in our comparator set may be immaterial. The average equity beta estimates from Frontier Economics' analysis of non-energy infrastructure firms range from 0.58 to 0.91,[1099] which is consistent with our final equity beta estimate of 0.7.

1097 Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 20.

1098 Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 34.

1099 See Frontier Economics, *Estimating the equity beta for the benchmark efficient entity*, January 2016, p. 21. This range is based on the raw and re-levered estimates presented in this report and excludes Asciano and Qube (as Frontier does).

H Return on debt approach

We transition all of the return on debt[1100] from an on-the-day approach in the first regulatory year to a trailing average by updating 10 per cent of the debt portfolio over 10 years (a full transition). This appendix explains why, if we move to a trailing average approach, doing so requires a full transition to achieve the allowed rate of return objective (ARORO). It also explains why we consider the on-the-day approach should apply if there is no transition between the current approach and the trailing average. In this appendix, a 'regulatory period' means a regulatory control period or an access arrangement period.

In setting out our reasons for this view, this appendix is structured as follows:

- Section H.1 establishes how we interpret the ARORO. This is with a particular focus on defining efficient financing costs (section H.1.1) and how the concept of a benchmark efficient entity interacts with the ARORO (section H.1.2).
- Section H.2 sets out what is required for us to form an allowed return on debt that contributes to the achievement of the ARORO. This includes:
    - section H.2.1—the need to provide ex-ante compensation for efficient financing costs (ex-ante efficient compensation) as opposed to providing compensation for historically incurred costs
    - section H.2.2—why we consider our approach is consistent with the National Electricity Law /National Gas Law (NEL/NGL)
    - section H.2.3—why we consider a revenue-neutral transition (in a present value sense) is required if there is a change in the methodology (or approach) for estimating the allowed return on debt (assuming that both methodologies can achieve the ARORO but produce different estimates at a given point in time).
- Section H.3 analyses the on-the-day and trailing average approaches to establish the extent these approaches can contribute to the achievement of the ARORO.
- Section H.4 establishes why a full transition can contribute to the achievement of the ARORO when moving from an on-the-day to a trailing average approach.
- Section H.5 explains why an immediate (or hybrid) transition will not achieve the ARORO given current interest rates relative to historical interest rates. This includes:
    - section H.5.1—a mathematical explanation.

[1100] For clarity, that is 100% of the base rate and DRP components of the allowed return on debt.

- section H.5.2—a further discussion responding to some issues raised in the service providers' revised proposals.[1101] Table 3-41 responds to arguments supporting an immediate transition to a trailing average. Then, we explain why we disagree with CEG's report recommending that if we apply a hybrid transition, we should assume a benchmark efficient entity would have hedged one third of the base rate (noting this argument becomes redundant as we do not apply a hybrid transition).[1102]

This section also explains why, to achieve the ARORO, the on-the-day approach should continue if there is no revenue-neutral transition from the current on the day approach.

H.1 Interpretation of the ARORO

The ARORO provides that the rate of return for a service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of standard control, prescribed transmission or reference services (regulated services).[1103] Given this, applying the ARORO requires an understanding of:

- efficient financing costs
- the degree of risk that applies to a benchmark efficient service provider in respect of the provision of regulated services.

We elaborate on these components of the ARORO in the following sections.

H.1.1 Efficient financing costs

The ARORO provides for a rate of return commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of regulated services. Given this, it is important to understand efficient financing costs.

Economists typically think of efficiency in three dimensions: productive, allocative and dynamic. Table 3-40 sets out how this applies in the context of debt financing.

Table 3-40 Application of economic efficiency to debt financing

Dimension of efficiency	Economic meaning[1104]	Application to debt financing[1105]

[1101] The service providers referred to are Australian Gas Networks (AGN), ActewAGL gas distribution, APTNT, Jemena Electricity Networks (JEN), United Energy, AusNet Services, CitiPower and Powercor.
[1102] CEG, *Critique of the AER's approach to transition*, January 2016.
[1103] NER, cl. 6.5.2(c); NER, cl. 6A.6.2(c); NGR, r. 87(3).
[1104] See Productivity Commission, *On efficiency and effectiveness: Some definitions*, May 2013, p. 3
[1105] We have previously discussed this in AER, *Better regulation: Rate of return guidelines consultation paper*, May 2013, pp. 75–6.

Productive efficiency	Achieved when output is produced at minimum cost. This occurs where no more output can be produced given the resources available, that is, the economy is on its production possibility frontier. Productive efficiency incorporates technical efficiency. This refers to the extent that it is technically feasible to reduce any input without decreasing the output or increasing any other input.	Refers to least cost financing (that is, the lowest required return on debt) subject to any constraints, such as risk. For our determinations to be productively efficient we need to incentivise service providers to seek the lowest cost financing (all else being equal).
Allocative efficiency	Achieved when the community gets the greatest return (or utility) from its scarce resources.	Allocative efficiency can be achieved by setting an allowed return consistent with the expected return in the competitive capital market (determined by demand and supply) for an investment of similar degree of risk as a service provider supplying regulated services.
Dynamic efficiency	Refers to the allocation of resources over time, including allocations designed to improve economic efficiency and to generate more resources. This can mean finding better products and better ways of producing goods and services.	Refers to the existence of appropriate investment incentives. We can encourage dynamic efficiency by setting an allowance that does not distort investment decisions. Dynamic efficiency is advanced through incentive regulation rather than cost of service regulation that compensates a service provider for its actual costs no matter how inefficient.

Source: AER analysis; Productivity Commission, *On efficiency and effectiveness: Some definitions*, May 2013; AER, *Better regulation: Rate of return guidelines consultation paper*, May 2013.

Because the market for capital finance is competitive, a benchmark efficient entity is expected to face competitive prices in the market for funds. Therefore, we consider efficient debt financing costs are reflected in the prevailing cost of debt observed in capital markets for an investment with a similar degree of risk as that which applies to a service provider in respect of the provision of regulated services.[1106] As Alfred Kahn stated:[1107]

> The public utility company competes with all other companies in the economy for the various inputs of its production process—for labour, materials, and capital. To the extent that these are supplied in open markets (instead of, for example, under negotiated bids), in principle there ought to be readily available objective measures of the prices of these inputs that have to be incorporated in the cost of service. This is clearly true of the capital input: since the regulated company must go to the open capital market and sell its securities in competition with every other would-be issuer, there is clearly a market price (a rate of interest on borrowed funds, an expected return on equity) that it must be permitted and enabled to pay for the capital it requires

[1106] We note the cost of debt (from a firm's perspective) is also known as investors' required rate of return on debt (from an investors' perspective).

[1107] Kahn, A.E., 'The economics of regulation: Principles and institutions', The MIT Press, Massachusetts, 1988, p. 45.

Similarly, Associate Professor Graham Partington and Professor Stephen Satchell (Partington and Satchell) interpret efficient financing costs as the opportunity cost of capital, which is a market rate of return for assets with a given level of risk.[1108] They advise the opportunity cost of debt is generally measured using the (appropriately benchmarked) yield to maturity.[1109] They also consider our use of a benchmark BBB+ credit rating and ten year term is appropriate.[1110]

We consider that productive, allocative and dynamic efficiency are advanced by employing a return on debt that reflects prevailing rates in the market for funds. This will also promote the long term interests of consumers in line with the National Electricity Objective / National Gas Objective (NEO/NGO).[1111]

H.1.2 Benchmark efficient entity

We consider a benchmark efficient entity would be 'a pure play, regulated energy network business operating within Australia'. This has been adopted in:

- The rate of return guidelines published in December 2013 (the Guideline).[1112] It is worth noting that while some service providers raised concerns with this during the Guideline development process, none objected to a notion that' a benchmark efficient entity' as referenced in the ARORO, would be an entity providing regulated services.[1113] To the contrary, stakeholders recognised that price and revenue caps had particular roles in mitigating risk as well as other features of the regulatory framework such as maintenance of the regulatory asset base.[1114]
- Our previous 2009 weighted average cost of capital (WACC) review.[1115]
- Our rate of return decisions following the publication of the Guideline.[1116]

1108 Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 15.

1109 However, Partington and Satchell note the yield to maturity overstates the (expected) opportunity cost of risky debt because it is based on the promised return, which exceeds the expected return on risky debt (due to default risk). See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 28.

1110 Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 31.

1111 The NEO is to 'promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to - (a) price, quality, safety, reliability and security of supply of electricity; and (b) the reliability, safety and security of the national electricity system'. Similarly the NGO is to 'promote efficient investment in, and efficient operation and use of natural gas services for the long term interest of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas'.

1112 AER, *Better regulation: Rate of return guideline*, December 2013, p. 7.

1113 AER, *Draft rate of return guideline*, August 2013, p. 9.

1114 APA Group, *Submissions responding to AER draft rate of return guideline*, 11 October 2013, p. 12–16; APIA, *Meeting the ARORO? A submission to the AER's draft rate of return guideline*, 11 October 2013, p. 11; MEU, *Comments on the draft guideline*, October 2013, p. 12.

1115 AER, *WACC review, final decision*, May 2009, p. 82.

1116 These include decisions for Ausgrid, Endeavour Energy, Energex, Ergon Energy, Essential Energy, Jemena Gas Networks, SA Power Networks, TasNetworks, Transend and TransGrid. These also include preliminary or draft decisions for ActewAGL gas, Amadeus gas pipeline, Australian Gas Networks, AusNet Services distribution, CitiPower, Jemena Electricity Networks, Powercor and United Energy.

We have devoted considerable time to considering the characteristics of a benchmark efficient entity in the Guideline and this decision, We consider a 'benchmark' is a reference point or standard against which performance of achievements can be assessed.[1117] For a benchmark to be useful, it must 'fairly and accurately represent the key attributes of the market segment or financial instrument in question'.[1118] As the AEMC recognised (underline added for emphasis):[1119]

> In order to meet the NEO and the NGO, this [allowed rate of return] objective reflected the need for the rate of return to "correspond to" the efficient financing costs of a benchmark efficient entity, this entity being one <u>with similar circumstances and degree of risk to the service provider</u>.

It is important to note that a debate has now arisen, since the submission of proposals in the matters under consideration, as to whether a benchmark efficient entity would be unregulated. In their recent revised proposals, service providers submitted that a benchmark efficient entity with a similar degree of risk in respect of the provision of regulated services must be an unregulated business.[1120] This followed the Tribunal hearing in an application for review of revenue determinations by Networks NSW, and ActewAGL which resulted in the Tribunal recently forming the view that a benchmark efficient entity referred to in the ARORO is likely not a regulated entity.[1121]

We did not consider this issue prior to the Tribunal's decision because it had not been raised substantively by any service provider.[1122] Consequently, the Tribunal did not have our fully formed view and reasoning before it when it considered this issue. We consider the Tribunal may have come to its position because it did not have our fully formed arguments before it. We intend to reconsider this issue fully when we undertake the remittal of the ACT and NSW DNSPs and JGN decisions. We base our

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1117 The World Bank and OECD have used this definition in OECD, *Glossary of key terms in evaluation and results based management*, 2002, p. 18, World Bank, *How to build M&E systems to support better government*, p. 138.

1118 CFA Institute, *Benchmarks and indices: Issue Brief*, April 2013, p. 2.

1119 AEMC, *Rule determination: Economic regulation of network service providers and price and revenue regulation of gas services*, 29 November 2012. p. 43.

1120 ActewAGL, *Appendix 5.01 detailed response to rate of return, gamma and inflation*, January 2016, p. 18; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 25; APA Group, *Amadeus Gas Pipeline access arrangement information*, January 2016, p. 24; AusNet Electricity Services, *Revised regulatory proposal*, 6 January 2016, p. 163; CitiPower, *Revised Regulatory Proposal 2016—2020*, 6 January 2016, p. 332; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, 6 January 2016, p. 16; Powercor, *Revised regulatory proposal 2016–20*, 6 January 2016, p. 326; United Energy, *2016 to 2020 revised regulatory proposal*, 6 January 2016, p. 79.

1121 Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, para 914.

1122 The AER submitted before the Tribunal that the contention raised before the Tribunal by Networks NSW and ActewAGL that the benchmark efficient entity was an unregulated firm was not raised and maintained before the AER, and was therefore precluded from being raised in submissions to the Tribunal by reason of s71O of the NEL. The Tribunal formed the view that the issue was raised by Networks NSW and by ActewAGL in submissions before the AER. The AER has sought judicial review by the Federal Court of this component of the Tribunal's decision.

analysis in this decision on the brief material submitted by ActewAGL and other service providers with coincident decisions.

After considering the material submitted by ActewAGL and others we maintain our view that the characteristic 'regulated' should be retained for a benchmark efficient entity when carrying out our analyses. For our analysis, see 'elements of the ARORO' under section 3.3.3 of attachment three.

With respect to the current decision before us, the proposal that a benchmark efficient entity would be unregulated was only raised in the revised proposals. This was a complete change in approach. Further, we do not consider that the material submitted with the revised proposals fully explores the implications of an unregulated benchmark efficient entity for all aspects of our decision on the allowed rate of return. While we consider our assessment in this final decision (given the information before us) is robust, we note that we have limited time to assess this new material or consult on this with stakeholders more broadly.

Regulation has a fundamental impact on the risk characteristics of a service provider in the provision of regulated services. Regulation provides a range of risk mitigation treatments that are unavailable to firms in competitive markets such as a revenue cap (or price cap), preservation of capital in a regulated asset base, pass through arrangements and shipwreck clauses.[1123]

Nevertheless, even if a benchmark efficient entity was necessarily unregulated, we do not consider this would affect our conclusions. Our approach to the cost of debt would be applicable to an unregulated firm if it had a similar degree of risk to the service provider in providing regulated services. Further, irrespective of whether a firm is regulated or not, efficient financing costs reflect the current (or prevailing) forward looking costs observed in capital markets.

H.2 Requirements under the ARORO

The ARORO provides that the rate of return for a service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of regulated services.[1124] We consider this requires us to set an allowed rate of return that appropriately compensates investors on their capital investments (in an ex-ante sense) and aims to minimise the long run cost of capital (all else being equal).[1125] By appropriate compensation we mean that the ex-ante return should be commensurate with the expected return in the capital market for an investment with a

1123 NGR, cl. 87(3). Similar wording is found in NER, cl. 6.5.2(c) and NER, cl. 6A.6.2(c).

1124 NER, cl. 6.5.2(c); NER, cl. 6A.6.2(c); NGR, r. 87(3).

1125 We must also apply the rules in a manner consistent with the RPPs in the NEL. This requires providing regulated service providers a reasonable opportunity to recover at least efficient costs and allowing for a return commensurate with the regulatory and commercial risk involved in providing direct control services. We should also provide effective incentives to promote economic efficiency and have regard to the economic costs and risk of the potential for under and over investment by a regulated service provider.

similar degree of risk as that of a benchmark efficient entity in the position of the service provider supplying regulated services.[1126] We consider this is the efficient return expected in a competitive capital market, consistent with models underpinning financial theory on efficient markets.[1127]

We elaborate on this in the following sections by setting out why and how a rate of return that meets the ARORO must:

- provide for ex-ante efficient compensation
- be consistent with the NEL/NGL
- require a revenue-neutral transition if there is a change in the methodology used to estimate the allowed return on debt (assuming that both methodologies can meet the ARORO but produce different estimates across time).

H.2.1 Ex-ante efficient compensation

We consider a rate of return that meets the ARORO must provide ex-ante compensation for efficient financing costs (we refer to this as ex-ante efficient compensation).

We consider ex-ante efficient compensation should result in the ex-ante allowed return on capital cash flows having a present value equal to the present value of the ex-ante efficient cost of capital cash flows required to finance the regulatory asset base (RAB). This means we must set, ex-ante, an allowed rate of return for a benchmark efficient entity such that the return on its investment (in its RAB) equals its efficient cost.[1128] This is a zero net present value (NPV) investment condition,[1129] which is a forward looking concept that shows a benchmark efficient entity is provided with a reasonable opportunity to recover at least efficient financing costs over the life of its investment (in its RAB). Partington and Satchell described it as follows:[1130]

> 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

[1126] We consider this is commensurate with definition of a 'fair return' to capital in Leland, H.E., 'Regulation of natural monopolies and the fair rate of return, *The Bell Journal of Economics and Management Science*, Vol. 5, No. 1, spring 1974, p. 7. Here, a fair return to capital is a pattern of profits across states of nature just sufficient to attract capital to its present use, which is equivalent to the stock market value of the firm equalling the value of a firm's assets.

[1127] For instance, this is consistent with zero expected returns in excess of equilibrium expected returns and 'fair game' models of expected returns. For a brief explanation of 'fair games' see Malkiel, B. G. and Fama, E. F. 'Efficient capital markets: A review of theory and empirical work, *The Journal of Finance,* 25: 383-417, 1970.

[1128] See SFG*, Preliminary analysis of rule change proposals: Report for AEMC*, February 2012, p. 41; Brennan, *Depreciation, investor compensation and, welfare under rate-of-return regulation*, Review of industrial organisation, 1991, 6, p. 75. In his article, Brennan stated, 'With regard to investor compensation, the basic goal of regulation is to give investors an income stream just sufficient to cover the costs of their assets, and no more'.

[1129] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p.14.

[1130] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 14.

> 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.

As discussed in section 3.3.3 and H.1.1, we consider efficient financing costs, for debt and equity, should be based on (appropriately benchmarked) prevailing market rates. This reflects the current opportunity cost of capital for investments of similar risk to a benchmark efficient entity in the position of a service provider supplying regulated services.[1131] The opportunity cost of capital is the rate used to discount firms' expected future cash flows in NPV calculations.[1132]

Under the ex-ante regulatory regime, we reset the allowed rate of return (through the returns on debt and equity) at the commencement of each regulatory period (or annually for the allowed return on debt if we use a trailing average). If the allowed rate of return is reset to reflect the prevailing market cost of capital, it provides ex-ante efficient compensation over each reset period.[1133]

As shown in section H.3, the on-the-day approach resets the allowed return on debt to reflect the prevailing market cost of debt at the commencement of each regulatory period. Therefore, it provides ex-ante efficient compensation on debt capital over each regulatory period and over the life of the investment (that is, over the term of the RAB).[1134] The trailing average approach resets one tenth of the allowed return on debt to reflect the prevailing market cost of debt at the commencement of each regulatory year. As such, it provides ex-ante efficient compensation on debt capital only over the term of the RAB if a full transition is applied.[1135]

The concept of ex-ante efficient compensation can be likened to the valuation of a coupon paying security with interest payments that are either fixed at issuance or reset periodically. Similarly, the regulatory regime allows the regulator to set (ex-ante) a series of fixed cash inflows (revenues) for a service provider that is reset periodically.

1131 See, Peirson, Brown, Easton, Howard, Pinder, *Business Finance*, McGraw-Hill, Ed. 10, 2009, p. 427, 434; Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 15.

1132 Partington and Satchell state that, 'the opportunity cost of capital is the discount rate that determines the market value of the benchmark efficient entity' (see Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 15, 29).

1133 See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 14–15; SFG*, Preliminary analysis of rule change proposals: Report for AEMC*, February 2012, p. 47.

1134 The expected future cash flows under an on-the-day methodology can be likened to a long term floating rate security where the coupon rate is reset at the commencement of each regulatory period.

1135 The expected future cash flows under a trailing average methodology can be likened to 10 long term floating rate securities where the coupon rates are reset every ten years. Each floating rate security covers a 10 per cent 'investment portion' in the RAB where they receive the net operating cash flows generated from these investment portions.

The basic pricing formula for a debt security (for example, a bond) at time $t = 0$ is as follows:[1136]

$$P_0 = \sum_{t=1}^{T} \frac{C_t}{(1 + r_0)^t} + \frac{P_T}{(1 + r_0)^T}$$

where: P_0 is the price of the bond at time 0

C_t is the coupon (or interest) payment at time t—$C_t = c * P_T$

c is the coupon rate

r_0 is the required rate of return or cost of capital (based on market rates) at time 0

P_T is the face (or par) value of the bond (or principal repayment) at maturity.

The above formula shows that for a bond's price to equal its face (or par) value, at any time 0, the coupon rate (which is akin to the allowed rate of return) must be set (or reset) to equal the prevailing cost of capital.[1137] If the coupon rate is set (or reset) to a value above (below) the prevailing cost of capital, the price of the bond would trade above (below) its face value. This means the investor that paid the face value would be ex-ante over (under) compensated relative to other investments of similar risk.

Compensation for historically incurred costs

We do not interpret the ARORO to require us to compensate a benchmark efficient entity for historically incurred financing costs where this will lead to compensation that would not be ex-ante efficient.

We consider setting an allowed rate of return that provides ex-ante efficient compensation gives a benchmark efficient entity a reasonable opportunity to recover at least efficient financing costs. This sets a forward looking return on investment based on investor expectations, and does not provide compensation for actual (historical) cost outcomes that can only be identified ex-post. As such, we consider ex-post movement in interest rates (after the allowed rate of return has been set for a regulatory period) do not affect the principle of ex-ante efficient compensation as long as the ex-ante rate of return appropriately reflects the risk of the investment in the RAB.[1138] Partington and Satchell agree with this view.[1139] The timeline below shows

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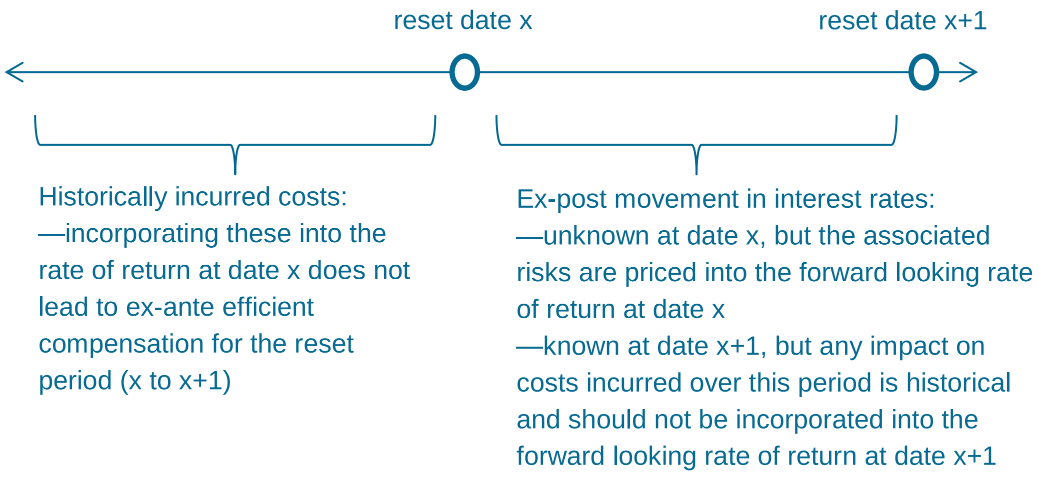
1136 Peirson, Brown, Easton, Howard, Pinder, *Business Finance*, McGraw-Hill, Ed. 10, 2009, p. 85.

1137 The required rate of return for a fixed term bond is the par yield in the market for fixed term bonds with similar characteristics (e.g. term and credit rating). However, we note that for a floating rate bond, the yield to equate the price to the face value may only equal the par yield on a fixed term bond with a maturity equal to the reset date of the variable rate note under certain assumptions. This may not include future default risk beyond the reset date. We discuss the valuation of a long term floating rate security as a conceptual analogy to our regulatory regime. This does not imply that the allowed return on debt should be equal to the required return on a floating rate bond. We use the par yield on fixed-term debt to calculate the allowed return on debt. Given we benchmark the cost of debt from the private sector service providers we regulate, we consider our use of the par yield on fixed term debt is appropriate.

1138 Specifically, under the rules, the rate of return must reflect the risk of a benchmark efficient entity with a similar degree of risk as a service provider supplying regulated services. This is consistent with Partington and Satchell's advice that 'the fundamental principle is that what drives the required return on the investment is the risk of the how we consider ex-post movements in interest rates (and historical costs) relate to ex-ante efficient compensation.



If, at reset date x+1, we set an allowed rate of return that provides compensation for a service provider's actual (historical) cost outcomes from the previous period, we would effectively remove realised gains or losses from risk it had previously borne. The regulatory regime is an ex-ante regime that is not intended to remove all risk from service providers and their capital investors. We set a forward looking allowed rate of return that compensates investors with a risk premium over the risk free rate for the compensable risk of their investment. The risk premiums we set (on both debt and equity) are based on appropriate benchmark returns from capital markets. If we removed all risks facing capital investors then the appropriate return would theoretically be the risk free rate.

Critically, if an investor, at date x+1, looks back and sees it made a gain (or loss) in relation to an investment it made at date x, this does not mean the investor is incorrectly over (or under) compensated. The gain (or loss) is due to the realisation of risk that was associated with the investment when it was made at date x. Likewise, service providers (and their investors) are not incorrectly compensated because they (at date x+1, looking back) have made a loss (or gain) due to ex-post movements in interest rates impacting the value of their liabilities differently to their regulated revenue set at date x. Again, the gain (or loss) is due to an ex-post realisation of risk, risk for which investors received ex-ante compensation for bearing. This is accepted risk, which is a critical part of the choice to make a risky investment.

In an investment context there is no need to compensate investors for gains or losses resulting from a realisation of risk for which they have been ex ante efficiently

assets' (see Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 21–22).

1139 See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 35–36.

compensated for bearing. In our regulatory context, investors have invested in the service providers we regulate under the knowledge they would bear the interest rate risk associated with the on-the-day methodology. In addition, the way we benchmark the allowed rate of return (in particular, the return on equity) provides compensation for bearing this risk (see below). On this basis, we consider no further compensation for the gains or losses associated with ex-post movements in interest rates is required or appropriate.[1140]

Desirability of minimising mismatch

In determining the allowed return on debt, we are required to have regard to the 'mismatch' between a benchmark efficient entity's actual debt cost outcomes (or cash outflows) and the return on debt allowance.[1141] However, we do not consider that this permits us to set a rate of return that will not meet the ARORO or will not achieve the NEO/NGO.

Rather, some mismatch between the actual (cash) debt costs and the regulated debt allowance is an intrinsic part of incentive regulation—whether the allowance is set using a trailing average approach or otherwise. This is because a mismatch can only be identified ex-post and we set an ex-ante fixed regulatory allowance based on forecast efficient costs. This allowance is not revised ex-post for a service provider's actual (historical) costs (see above).[1142] SFG recognised this in its report for the Australian Energy Market Commission (AEMC). Here, SFG considered a mismatch between a firm's debt service payments and the regulatory allowance could arise for a number of reasons, including:[1143]

- ‘because the cost of capital is, in fact, variable over time’ rather than because there is problem with the measurement
- because 'there may be a difference between the rate at which the business can borrow and the regulatory benchmark'.

We consider a service provider's ex-post mismatch does not (of itself) imply the regulator is setting a rate of return that will not appropriately compensate a benchmark efficient entity for its efficient cost of debt finance. A mismatch does not mean the present value of the ex-ante allowed return on debt (or return on capital) cash flows will not equal the present value of a benchmark efficient entity's ex-ante efficient debt financing costs (or overall capital financing costs). Rather, we consider it is the risk of a

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[1140] Also see Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 32–37, 39, 43.

[1141] As required under NER, cl 6.5.3(k), which requires us to have regard to ‘the desirability of minimising any difference between the return on debt and the return on debt of a benchmark efficient entity referred to in the allowed rate of return objective’.

[1142] See, for example, AER, *Submission to the Productivity Commission: inquiry into electricity network regulation*, April 2012, p. 4. It is worth noting that while the rules establish an ex-ante regulatory regime, they also include some ex-post elements. For example, see provisions on cost pass throughs under NER, cl. 6.6.1; NER, cl. 6A.7.3; cl ; NGR, cl 97(1)(c).

[1143] SFG, *Rule change proposals relating to the debt component of the regulatory rate of* return, August 2012, p. 35.

mismatch occurring that is relevant to ex-ante regulation. This risk is a form of interest rate risk.

In section H.3.3, we show (through present value relationships) that both an on-the-day and trailing average approach (with a full transition) should, in principle, provide the same ex-ante compensation for a benchmark efficient entity's efficient financing costs over the term of the RAB. We consider these present value relationships show both approaches can provide a benchmark efficient entity with ex-ante efficient compensation and meet the ARORO. There is no ex-ante over- or under-compensation overall (that is, over the term of the RAB), regardless of a benchmark efficient entity's actual (ex-post) cost outcomes.

We consider ex-ante systematic over- or under-compensation can only occur if the interest rate risk arising from an expected mismatch affects a benchmark efficient entity's cost of capital and the allowed rate of return does not reflect this. However, we benchmark the allowed rate of return (which requires consistently benchmarking the return on debt, return on equity and gearing)[1144] on observed data from service providers comparable to a benchmark efficient entity operating under an on-the-day approach (where the risk of mismatch is likely more material).[1145] Therefore, the allowed rate of return should be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as a regulated service provider operating under this approach. To the extent a benchmark efficient entity's investors expect that moving to a trailing average approach would reduce the risk they require compensation for, our allowed return on debt will likely be generous to service providers.[1146] In particular, our estimate of systematic risk (beta) includes historical data, which will capture the systematic risk that a benchmark efficient entity would have been exposed to under the on-the-day approach.

We also note that Partington and Satchell consider mismatch between a service provider's actual incurred cost of debt and allowed return on debt is a consequence of

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[1144] In particular, we consider any mismatch between the regulatory return on debt allowance and a benchmark efficient entity's actual debt costs will flow through to equity holders (as they are residual claimants). The equity beta is determined using historical data (when an on-the-day approach was in effect). We consider this should capture any interest rate risk associated with an on-the-day approach, to the extent that it is systematic.

[1145] For instance, we use the equity returns of service providers comparable to a benchmark efficient entity ('comparator firms') when estimating the equity beta. We also used comparator firms when estimating the credit rating and gearing of a benchmark efficient entity. This assists us in estimating an allowed rate of return that would compensate a benchmark efficient entity for the default risk and systematic risk more broadly that it would have faced under an on-the-day approach.

[1146] Compensable risk could decrease if investors consider a benchmark efficient entity is less exposed to interest rate risk under the trailing average approach. This could occur if the trailing average approach allows a benchmark efficient entity to better match its debt cash outflows to its allowance than under the on-the-day approach. However, we note Partington and Satchell consider that, 'It is difficult to see how the use of the trailing average will materially reduce the financing costs of firms since such costs are primarily driven by the assets the firms invest in'. See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 38.

its particular debt financing choices. They do not consider this affects a benchmark efficient entity's opportunity to earn the efficient return on its RAB.[1147]

Moreover, the desirability of minimising (ex-post) debt cash flow mismatch is not the only type of interest rate mismatch risk we consider relevant. The rules require us to have regard to the desirability of minimising this type of mismatch for a benchmark efficient entity. However, there can also be a mismatch between the allowed return on debt and the prevailing cost of debt for a benchmark efficient entity at the time at which the allowed rate of return is reset. We consider this can affect the ability of a return on debt approach to provide ex-ante efficient compensation, and can also result in investment distortions.[1148] To the extent that this type of mismatch results in compensation that is not ex-ante efficient, we consider this would not meet the ARORO.

While a trailing average approach is expected to reduce the former type of mismatch relative to an on-the-day approach, an on-the-day approach is expected to reduce the latter type of mismatch relative to a trailing average approach.

H.2.2 Consistency with the NEL/NGL

We consider an allowed rate of return that meets the ARORO should lead to economically efficient investment, provision of and use of infrastructure, consistent with the NEL/NGL.[1149] This allowed rate of return should also provide service providers with a <u>reasonable opportunity</u> to recover their efficient costs. We consider our interpretation of the ARORO is consistent with the wording in the NEO/NGO in the NEL/NGL. Our view appears consistent with the views of the AEMC when it stated:[1150]

> If the rate of return estimate is set to the efficient required return, there will be no incentive for under- or over- investment. Such incentives for inefficient investment become more pronounced when the rate of return estimate differs from the efficient required return.

The concept that a reasonable return to investment is important to achieving efficient regulatory investment appears common sense. Setting too high (or low) an expected return relative to the expected return on alternate equivalent risk investments would be expected to lead to distorted over (or under) investment in regulated assets (all else being equal). The aim of setting an expected return to achieve efficient investment also appears broadly accepted in regulatory literature.[1151] This is also consistent with advice from the Consumer Challenge Panel Sub Panel 3 (CCP3) that stated:[1152]

1147 Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 18, 35–36.

1148 See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 37–38; SFG, *Preliminary analysis of rule change proposals: Report for AEMC*, February 2012, p. 41.

1149 NEL, s. 7A(3); NGL, s. (24)(3).

1150 AEMC, *Final Rule Determination: Economic regulation of network service providers, and price and revenue regulation of gas services*, 29 November 2012, p. 14.

1151 Averch and Johnson show that if a regulatory rate of return exceeds the firm's true cost of capital, it has an incentive to choose too much capital relative to labour. Averch, H, Johnson, L.L., 'Behaviour of the Firm under

> The AER must have regard to the impact of their RoR decision on capex incentives. Given that the DNSPs' revised proposal is significantly above current costs of capital for BBB/BBB+ rated companies, there will be perverse incentives to overinvest in the network.

Similarly, Partington and Satchell consider the rule requirements are consistent with the zero NPV investment condition, stating:[1153]

> The national electricity and gas objectives are to achieve efficient investment and efficient operation in the long term interest of consumers, while the revenue and pricing principles allow for the recovery, by the regulated businesses, of efficient costs including a return on capital and having regard for the costs and risks of overinvestment. There is very clear criterion that can be applied to meet these requirements. That criterion is that investment in regulated assets should be a zero NPV activity.

H.2.3 Requirement for a revenue-neutral transition if there is a regime change

We consider that both an on-the-day methodology to setting the cost of debt and a trailing average methodology can meet the ARORO. However, in moving between different approaches, a transition that is revenue-neutral in a present value sense will meet the ARORO. Section H.3 further discusses the position that either approach can result in a reasonable return on capital (and therefore could meet the ARORO). This position also appears consistent with SFG's view that the AEMC noted in its final rule determination where it stated:[1154]

> In its report, SFG highlighted that for a given definition of the return on debt for an efficient benchmark service provider (in particular, the assumed credit rating and term to maturity) the average cost of debt will be the same over the long run. This is regardless of whether the return on debt estimate is based on the prevailing debt cost spot rate or an average of that spot rate. Changing to an averaging approach will not, in itself, systematically reduce or increase the allowed return on debt in the long run. SFG observed that averaging

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Regulatory Constraint', *American Economic Review*, Vol. 52, No. 5, December 1962, pp. 1062–1069. Littlechild describes, 'Revenues need to be adequate to cover operating expenses and to ensure finance for necessary investment. They should not be so excessive as to encourage their dissipation on dubious schemes'. Littlechild, S., 'Economic regulation of privatised water authorities and some further reflections, *Oxford review of economic policy*, Vol. 4, No. 2, summer 1988, p. 47. Cambini and Rondi find the cost of capital is positively correlated with investment under incentive regulation. Cambini, C., Rondi, L., 'Incentive regulation and investment: evidence from European energy utilities, *Journal of Regulatory Economics*, Vol. 38, 2010, p. 18. Greenwald notes that 'less than "fair" rates of return should simply elicit no investment' in Greenwald, B.C., 'Rate base selection and the structure of regulation', *The RAND Journal of Economics*, Vol. 15, No. 1, Spring 1984, p. 85.

1152 CCP3, *Submission to the AER: An overview—Response to the AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for a revenue reset for the 2016–2020 regulatory period*, 22 February 2016, p. 35.

1153 Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 14.

1154 AEMC, *Final Rule Determination: Economic regulation of network service providers, and price and revenue regulation of gas services*, 29 November 2012, pp. 74–75.

> approaches will by definition result in smoother estimates of the return on debt over time.

We note that when undertaking the rule change in 2012 the AEMC added in clause 6.5.3(k)(4) that states (emphasis added):

> (k) In estimating the return on debt under paragraph (h), regard must be had to the following factors…
>
> (4) any impacts (including in relation to the costs of servicing debt across regulatory control periods) on a benchmark efficient entity referred to in the allowed rate of return objective that could arise **as a result of changing the methodology** that is used to estimate the return on debt from one regulatory control period to the next.

This clause is explicit in requiring us to have regard to any impacts on a benchmark efficient entity that could arise as a result of a change of methodology. This would include having regard to any material changes in the present value of a benchmark efficient entity's regulated revenue purely due to changing the debt estimation methodology. If such changes increased a benchmark efficient entity's value, then this would benefit its equity holders at the expense of consumers. Conversely, if such changes decreased a benchmark efficient entity's value, then this would cost its equity holders but provide a short term financial benefit to consumers (which may not be a long-term benefit to the extent this results in underinvestment). As such, this methodological change may also have a material negative impact on the confidence in the predictability of the regulatory regime.[1155] We consider the AEMC's guidance on the intent of this clause is consistent with our approach (emphasis added):[1156]

> The purpose of the fourth factor is for the regulator to have regard to **impacts of changes in the methodology** for estimating the return on debt from one regulatory control period to another. Consideration should be given to the potential for consumers and service providers to face a significant and unexpected change in costs or prices that may have negative effects on confidence in the predictability of the regulatory arrangements.

We have taken this factor into account and consider our transitional approach is consistent with the intent of this factor. Nevertheless, we consider that irrespective of this factor, our transition approach meets the requirements of the ARORO, NEO/NGO and RPPs. Partington and Satchell and the CCP3 formed a similar view that the full transition to a trailing average in the Guideline would better satisfy the ARORO than the service providers' revised proposals.[1157] We also consider that an immediate (or

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1155 HoustonKemp, *Appropriate objective to guide the setting of the cost of debt allowance*, 3 March 2015, p. 5.

1156 AEMC, *Final Rule Determination: Economic regulation of network service providers, and price and revenue regulation of gas services*, 29 November 2012, p. 85.

1157 CCP3, *Submission to the AER: An overview—Response to the AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for a revenue reset for the 2016–2020 regulatory period*, 22 February 2016, p. 36; CCP3, *Submission to the AER: Response to the AER Preliminary Decisions and revised proposals from Victorian* hybrid) transition to a trailing average would result in a material and unexpected change in the present value of a benchmark efficient entity relative to a value consistent with investor expectations formed under the on-the-day regime. If this occurred it would likely increase expected regulatory uncertainty going forward. We consider this may both undermine confidence in the predictability of the regulatory arrangements and not minimise efficient financing costs (all else being equal).[1158] For these reasons, we consider a lack of transition to limit uncertainty of regulatory changes affecting the value of the benchmark efficient entity is unlikely to be consistent with achieving the NEO/NGO and the RPPs.

Similarly, SFG advised the AEMC that a transition may be required to limit 'regulatory risk' and to avoid being inconsistent with the NEO and RPPs.[1159] SFG also considered that the transition we proposed (the QTC method) would be an appropriate means of transitioning from the current rules (that used an on-the-day methodology) to the use of a historical average cost of debt approach.[1160] The desirability for predictability was also commented on by an Expert Panel on Energy Access pricing for the Ministerial Council on Energy in 2006 who noted [emphasis added]:[1161]

> Regulatory (and hence investor and user) risk can greatly be reduced if decisions are made in a timely and predictable manner. Timeliness in access decisions (including any merits and judicial review process) is important for both reducing the costs of the regime and minimising uncertainty associated with the outcome of the review…
>
> **Equally important is the predictability of those decisions** – that is the development of an approach that gives energy users and investors in transmission and distribution infrastructure confidence that access and pricing outcomes will be guided by known principles that are applied in a consistent manner.

We consider our approach is consistent with the desire for predictability in regulatory decisions by using a transition to avoid material wealth impacts from the change in methodology. HoustonKemp also provided support for a transition when it advised the Essential Services Commission of SA (ESCOSA):[1162]

> Consistent with regulatory best practice, a regulatory authority should seek to avoid imposing windfall gains or losses as a result of regulatory changes. A

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electricity DNSPs for a revenue reset for the 2016–2020 regulatory period, 25 February 2016, p. 88; Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 52.

1158 HoustonKemp also held this view in *Appropriate objective to guide the setting of the cost of debt allowance*, 3 March 2015, p. 5.

1159 SFG, *Rule change proposals relating to the debt component of the regulatory rate of* return, August 2012, p. 45. Similarly, Partington and Satchell consider an immediate transition to a trailing average approach can be regarded as a material regulatory risk (Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 42).

1160 SFG, *Rule change proposals relating to the debt component of the regulatory rate of* return, August 2012, p. 46.

1161 Expert Panel on Energy Access Pricing, *Report to the Ministerial Council on Energy*, April 2006, p. 59.

1162 HoustonKemp, *Appropriate objective to guide the setting the cost of debt allowance*, March 2015, p. 5.

> regulatory change that imposes windfall gains or losses will be to the detriment of regulatory certainty and will likely increase the perceived level of regulatory risk, and so the cost of capital.

A transition is also likely to be important for maintaining the incentives on service providers to adopt efficient financing practices under the regulatory regime. We consider this is consistent with the Revenue and Pricing Principles, which indicate regulated firms should be provided with a range of incentives including incentives that should promote the efficient provision of electricity network/pipeline services.[1163] These principles show our regime is intended to be an incentive base regime as opposed to a cost of service regime. To promote efficiency incentives, we consider regulated firms should be required to bear the consequences of their chosen financing approach from the prior regulatory period where returns were set under the on-the-day methodology and any financing decisions they made over this period were made in the expectation this methodology would continue. It could significantly undermine service providers' incentives to manage financial risk efficiently if we provide an allowed return on debt in this decision that results in regulated firms not bearing the consequences of their chosen financing practices. This is because service providers were required to bear and manage this risk.[1164]

H.3 On-the-day and trailing average approaches

In this section, we analyse the on-the-day and trailing average approaches to establish whether these approaches can contribute to the achievement of the ARORO. We also explain that, while we consider both approaches would be open to us; we would expect either approach to produce different estimates at given points in time.

From establishing this, we can demonstrate that in changing approaches from the on-the-day to the trailing average approach (or vice versa); a revenue neutral transition (in present value terms) is required to contribute to the achievement of the ARORO.

H.3.1 On-the-day approach

The on-the-day approach estimates the allowed return on debt for a service provider as the prevailing cost of debt as close as possible to the start of the regulatory period.[1165] The on-the-day approach is the longstanding return on debt approach adopted by us and generally by other regulators in Australia.[1166] While the NER/NGR

1163 NEL, s7A(3)(b); NGL, s24(3)(b).

1164 See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 42.

1165 The on-the-day benchmark requires estimating the return of debt of a service provider on the first day of the regulatory period because, in theory, an on-the-day rate is considered the best indication of the opportunity cost of capital at a given point in time. However, in practice, it entails estimating the return on debt over a short averaging period as close as practically possible to the start of the regulatory period. This is because using the on-the-day approach exposes the service provider to day-to-day volatility in the market rates.

1166 The on-the-day approach has been used to estimate the return on debt of service providers in Australia since at least 1998, by the ACCC/AER as well as other state regulators. See, for example, ACCC, *Final decision: APA GasNet transmission*, October 1998, p. xvi; ACCC, *Statement of principles for the regulation of electricity* no longer mandate that we adopt this approach, they still make it available to us.[1167] Prior to the rules changes in 2012, the on-the-day approach was used to not only set the return on debt but was used to set the overall allowed rate of return. Post the rule changes, the on-the-day approach will continue to be used to set the allowed return on equity as this remains mandated by the rules.[1168]

We consider the on-the-day approach can estimate an allowed rate of return commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as a service provider in the provision of regulated services. This is because the on-the-day approach provides service providers with a reasonable opportunity to recover at least efficient costs over the term of the RAB and over each regulatory period (see section H.3.3). Ex-ante efficient compensation holds for each regulatory period under this approach because the entire allowed rate of return is reset to reflect the prevailing market cost of capital at the commencement of each regulatory period. In this way, the allowed revenue under the on-the-day approach can be likened to a form of long term floating rate security where the interest (or coupon) rate is reset to reflect prevailing market rates at the start of each regulatory period. Any compensable risk from the resetting process under the on-the-day approach is largely born by equity holders of the regulated firms. As SFG advised the AEMC, 'any mis-match between the cash inflows and cash outflows in relation to the return on debt will flow through to the equity holders'.[1169]

While we have chosen to move towards a trailing average approach (section H.3.2 explains why we consider a trailing average approach is open to us), this does not imply that the on-the-day approach provides an 'incorrect' outcome or an outcome inconsistent with the ARORO. Rather, we consider the on-the-day approach has advantages, including:

- It is consistent with the prevailing market cost of debt as close as possible to the commencement of the regulatory period. As such, it is commensurate with efficient financing costs at the commencement of the regulatory period and can promote efficient investment decisions. It is also internally consistent with how we estimate other components of the allowed rate of return and other building block components.
- It leads to an estimate that is likely to more closely imitate the outcomes of a competitive market near the start of the regulatory period than a trailing average approach.

Consistent with prevailing market cost of debt

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transmission revenues—background paper, December 2004, pp. 96, 109. At this time, the risk free rate and DRP were estimated separately and added together to generate a return on debt estimate.

1167 See NER, cl. 6.5.2(j)(1); NER, cl. 6A.6.2(j)(1); NGR, r. 87(10)(a).

1168 NER, cl. 6.5.2(g); NER, cl. 6A.6.2(g); NGR, cl. 87(7).

1169 SFG, *Rule change proposals relating to the debt component of the regulated rate of return: Report for AEMC*, August 2012, p. 5.

As discussed in section H.1.1 and H.2.1, we consider efficient financing costs, for debt and equity, should be based on (appropriately benchmarked) prevailing market rates. As shown mathematically in section H.3, the on-the-day approach resets the entire allowed rate of return (which includes the return on debt) to reflect, as closely as possible, the prevailing market cost of capital (which includes the cost of debt) at the commencement of each regulatory period.

We consider an allowed return on debt that reflects the prevailing market cost of debt promotes efficient investment decisions. When firms make investment decisions, they estimate the cost of capital based on prevailing market rates. This is important because the cost of capital is based on investors' expectations of future returns.[1170] Firms then use this estimate to set a discount rate at which they discount the expected future cash flows of the proposed investment in order to determine its viability (that is, whether the NPV of the expected cash flows is greater than or equal to zero).

As discussed in section H.2.1, we consider the ARORO requires us to set an allowed rate of return for a benchmark efficient entity such that the return on its investment in its RAB equals its efficient cost (that is, the zero NPV investment condition). The prevailing market cost of capital is the only discount rate that sets the present value of expected future cash flows equal to the RAB. In its 2012 report to the AEMC, SFG summarised this point by stating:[1171]

> The principle which underpins the regulatory framework in Australia is to estimate a price which equates the present value of expected cash flows to the regulated asset base. If the regulated rate of return is set at a rate other than the cost of capital this will no longer hold. Investment decisions will be distorted.

Similarly, Partington and Satchell (who recommend the on-the-day approach) stated:[1172]

> By definition, a stream of expected cash flows that allows the current required return on the book value of capital invested, recovers the capital invested and covers other costs, will have a discounted present value that ex-ante is equal to the book value of the investment. Allowing this cash flow for a regulated business, the book value of the RAB will be equal to the market value of the RAB. To put it another way this cash flow gives rise to a zero NPV investment.

Therefore, we consider the on-the-day approach provides an appropriate signal for investment decisions made near the commencement of the regulatory period. We consider this would promote efficient investment decisions that increase dynamic efficiency. This aligns with the AEMC's view that:[1173]

1170 Peirson, Brown, Easton, Howard, Pinder, *Business Finance*, McGraw-Hill, Ed. 10, 2009, p. 434.

1171 SFG*, Preliminary analysis of rule change proposals: Report for AEMC*, February 2012, p. 4.

1172 Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 17.

1173 AEMC, *Final Rule Determination: Economic regulation of network service providers, and price and revenue regulation of gas services*, 29 November 2012, p. 73.

> [the return on debt framework] should try to create an incentive for service providers to adopt efficient financing practices and minimise the risk of creating distortions in the service provider's investment decisions.

If we were to set the allowed return on debt in a different way, it would no longer be an estimate of the cost of debt (and thus the cost of capital) at the time of the determination or access arrangement. For example, under a trailing average approach, the overall allowed return on debt predominately compensates for historical interest rates, rather than for the risk of providing debt finance in the future.[1174] Only 10 per cent of the allowed return on debt will compensate for the risk of providing debt finance in the future because 10 per cent of the return on debt is updated annually to reflect prevailing interest rates. As discussed in section H.2.1, this results in a mismatch between the allowed return on debt and the prevailing cost of debt for a benchmark efficient entity at the time of the determination or access arrangement.

Moreover, estimating a forward looking return on debt at the time of the determination or access arrangement is consistent with how we determine the return on equity and other components of the building block model. For example, we determine an allowed return on equity that reflects, as closely as possible, the prevailing market cost of equity at the time of the determination or access arrangement. We also forecast the operating expenditure that will apply for each year of the upcoming regulatory period. Determining the allowed revenue for the regulatory period ex-ante, without within-period revisions, is consistent with the principles of incentive regulation.[1175]

Imitates the outcomes of a competitive market

We consider an allowed return on debt that reflects the prevailing market cost of debt at the time of the determination or access arrangement (that is, an on-the-day approach) is likely to promote economic efficiency because:

- Productive efficiency refers to least cost financing (that is, the lowest required return on debt). An allowed return on debt that reflects the (appropriately benchmarked) prevailing market cost of debt will likely promote productive efficiency. This is because a benchmark efficient entity faces competitive prices in the market for funds.
- Allocative efficiency refers to the allowed return on debt reflecting investors' opportunity cost of debt for investments of similar risk. The prevailing market cost of debt at any given time is likely to reflect investors' opportunity cost. This is because the market for capital finance is competitive with many buyers and sellers.
- Dynamic efficiency refers to the existence of appropriate investment incentives. As discussed above, a return on debt that reflects the prevailing market cost of debt

[1174] SFG, *Preliminary analysis of rule change proposals: Report for AEMC*, February 2012, p. 46.

[1175] See Office of the Regulator General, *Submission to the Productivity Commission review of the national access regime (part IIIA of the trade practices act) position paper*, 2001, p. 6.

provides an appropriate signal for new investment and promotes efficient investment decisions.

Moreover, a return on debt that better reflects the prevailing market cost of debt more closely imitates the outcomes of a competitive market. This is because the current market cost of debt reflects investors' opportunity cost of debt for investments of similar risk.

The current market cost of debt represents the costs that other service providers will face to enter the market. The on-the-day approach is more consistent than the trailing average approach with the theory that prices in a competitive market would be constrained by the entry, or threat of entry, of new providers. This is because in a competitive market, prices are theoretically constrained by entry or the threat of entry.[1176] As observed by HoustonKemp:[1177]

> when economic regulation was first introduced regulators sought to imitate the outcomes of a competitive market. That is, regulators sought to set prices consistent with the theory that in a competitive market prices would be constrained by the entry, or threat of entry, of new providers. This is colloquially known as the ‘new entrant price’.

Similarly, Chairmont captured this concept when it advised:[1178]

> The solution should take current market rates and use those to project forward, rather than taking trailing averages as an indicator of future financing costs. The look forward approach is consistent with measuring the opportunity cost of capital and for the typical pressures, including from new entrants, faced by participants in an efficient competitive market.

We also note that Partington and Satchell considered the on-the-day approach is consistent with competitive market outcomes, stating:[1179]

> The equilibrium in a competitive market is that investments in assets are zero NPV. This implies that firms can expect to recover the current cost of capital, which in the form of the WACC includes the current cost of debt.

H.3.2 Trailing average approach

The trailing average approach estimates the allowed return on debt for a service provider as an average of the cost of debt over 10 years (which is annually updated). This approach is available to us under the NER/NGR.[1180]

1176 HoustonKemp, *Memo: Appropriate objective to guide the setting of the cost of debt allowance*, 3 March 2015, p. 1.

1177 HoustonKemp, *Memo: Appropriate objective to guide the setting of the cost of debt allowance*, 3 March 2015, p. 1. Also see Chairmont, *Cost of debt comparative analysis*, November 2013, p. 4.

1178 Chairmont, *Cost of debt comparative analysis*, November 2013, p. 4.

1179 Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 46.

1180 See NER, cl. 6.5.2(j)(2); NER, cl. 6A.6.2(j)(2); NGR, r. 87(10)(b).

We consider the trailing average approach can estimate an allowed rate of return commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as a service provider in the provision of regulated services. Under the trailing average approach, ex-ante efficient compensation is unlikely to hold for each regulatory period. However, if there is an appropriate (full) transition, it should hold over the term of the RAB. Therefore, service providers would have a reasonable opportunity to recover at least efficient costs over the term of the RAB. We show this in section H.3.3.

Further, the trailing average approach may have particular benefits that an on-the-day approach cannot achieve. For instance, when it advised the AEMC, SFG stated that 'if it can be demonstrated that the benefits of a regulated rate of return which is less variable over time outweigh the costs associated with investment distortions, then a trailing average should be considered'.[1181] The potential benefits mainly relate to smoother prices and a potentially reduced mismatch between a benchmark efficient entity's actual debt cost outcomes (or cash outflows) and the allowed return on debt (see section H.2.1), which we discuss further below.

However, the trailing average also has disadvantages relative to an on-the-day approach (see sections 2.1 and 3.1). Given the trade-offs, we do not consider the trailing average is clearly preferable to the continued use of the on-the-day approach. For the reasons discussed in this appendix, we consider a change in methodology (to a trailing average approach) would not contribute to the achievement of the ARORO or meet the NEO/NGO unless it was revenue-neutral (in present value terms) as this would result in incorrect ex-ante compensation.

Reduced mismatch

In section H.2.1, we introduce and discuss the concept of an ex-post 'mismatch' between a benchmark efficient entity's actual debt cost outcomes (or cash outflows) and the regulatory return on debt allowance in determining the allowed return on debt. We consider an ex-post mismatch can occur for a number of reasons, including because a benchmark efficient entity does not (or cannot) engage in debt financing practices that result in debt cash outflows that match the regulatory return on debt allowance. We explain this below in the context of comparing the trailing average with the on-the-day approach to estimating the return on debt.

In any given regulatory period, a benchmark efficient entity will have existing debt that was previously issued and not yet matured. It will need to pay interest on this debt during the regulatory period, and these interest payments will be based on historical interest rates that prevailed in a previous period. If we adopt an on-the-day approach, then cash outflows from existing debt would be effectively revalued at current market rates.[1182] Unless a benchmark efficient entity can engage in debt financing practices

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[1181] SFG, *Preliminary analysis of rule change proposals: Report for AEMC*, February 2012, p. 41.

[1182] Lally, *The cost of debt*, 10 October 2014, p. 3.

that align its debt cash outflows with the regulatory allowance (all else being equal), it is expected that an ex-post mismatch may result. From our observations of past financing practices, it appears that individual service providers (and a benchmark efficient entity) are unlikely to engage in financing practices that fully align its debt cash outflows with the regulatory allowance under the on-the-day approach.

In contrast to the on-the-day approach, a trailing average approach is expected to better account for a benchmark efficient entity's actual (cash) debt costs within a regulatory period because it provides service providers with a return on debt allowance that they can more readily match each regulatory period.[1183] As such, this will likely reduce the mismatch between actual debt interest costs of regulated firms and the regulated return on debt allowance.[1184] Given that a trailing average approach reduces the risk of cash flow mismatch (a form of interest rate risk), it might better lead to productive efficiency. All else being equal, this reduced risk and the reduced need to enter hedging arrangements might lower the cost of financing.[1185]

Nevertheless, it is important to note that an ex-post mismatch does not result in a benchmark efficient entity being ex-ante over- or under-compensated for its efficient debt financing costs for a regulatory period or over the life of its assets (see sections H.2.1 and H.3.3).

H.3.3 Mathematical explanation

This section provides a mathematical explanation of the difference between the on-the-day and trailing average regimes in present value terms. While the mathematical explanation employs simplifying assumptions, this is for illustrative purposes and the principles hold true in more general situations. That is, mathematically, we demonstrate that in principle:

- The on-the-day approach provides service providers with the reasonable opportunity to recover at least efficient costs over each regulatory period and over the term of the RAB.[1186]
- The trailing average approach provides service providers with the reasonable opportunity to recover at least efficient costs over the term of the RAB.

If switching between regimes, a full transition provides service providers with the reasonable opportunity to recover at least efficient costs over the term of the RAB. That is, the same ex-ante compensation should be achieved under: an on-the-day

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1183 See AER, *Final decision: TransGrid transmission determination, Attachment 3*, April 2015, p. 150.

1184 HoustonKemp, *Memo: Appropriate objective to guide the setting of the cost of debt allowance*, 3 March 2015, p. 4.

1185 However, we note Partington and Satchell consider that, 'It is difficult to see how the use of the trailing average will materially reduce the financing costs of firms since such costs are primarily driven by the assets the firms invest in'.

1186 This is consistent with NEL s.7A(2). Lally advised that this principle in the NEL is ‘equivalent’ to the NPV principle. See Lally, *The risk free rate and the present value principle*, 22 August, 2012. SFG also appears to support using the NPV principle to assess rate of return approaches. SFG, *Preliminary analysis on rule change proposals: Report for AEMC*, February 2012, p. 47.

regime, a trailing average regime, or a switch from one regime to the other (but only if the switch is revenue neutral).

We use the following notation:

- CF_t denotes net operating cash flows for year t[1187]—that is, revenue less operating expenditure (opex).[1188] Under our depreciation assumptions, this can be expressed as $CF_t = r_t \times K_{t-1}$, where $r_t \times K_{t-1}$ is the return on capital cash flow.
- r_t is the allowed rate of return (which is reset periodically).[1189]
- K_t is the closing RAB at the end of year t (which equals the opening RAB at the beginning of year $t+1$).
- $r_{i,j}$ is the ex-ante cost of capital prevailing in the market for the investment at time i,[1190] with a term of j years—used to discount the expected cash flows.
- $E[.]$ denotes expected value.
- PV_t denotes present value, at year t (can also be referred to as market value).

For simplicity, we assume within-period investment equals depreciation in all periods prior to the end of the term of the RAB (year $t = T$),[1191] where all initial capital (K_0) is returned (as K_T).[1192] Therefore, within-period investment cancels out and $K_0 = D_1 + D_2 + \cdots + D_T = K_T$, where D_t is depreciation (or return of capital) for year t.

We note the mathematical explanation in this section is a simplification of reality. We use it to demonstrate the principle that the allowed rate of return should be set (and periodically reset) such that the ex-ante allowed return on (and of) capital cash flows equals the ex-ante cost of a benchmark efficient entity's investment in its RAB (in present value terms). This gives service providers a reasonable opportunity to recover at least efficient financing costs over the term of the RAB. As Brennan (1991) stated:[1193]

[1187] We assume the expected net operating cash flows for year t are equal to those allowed through our regulatory determinations / access arrangements.

[1188] That is, CF_t entails subtracting operating expenditure (opex) from total revenue on the assumption that the regulatory allowance for opex covers actual opex costs incurred. For clarity, this assumption is for ease of exposition and does not affect whether the ARORO is satisfied.

[1189] r_t is the allowed rate of return applied to year t (that is, to determine the net operating cash flow for year t). However, it is calculated using data in year $t-1$.

[1190] The investment is an investment with similar degree of risk as a service provider with respect to the provision of regulated services.

[1191] The end of the term of the RAB occurs at time T when the final return on capital and return of capital revenue allowances are provided. After this year there is no more capital finance to return to investors.

[1192] We note there are academic articles which support the view that the depreciation schedule does not affect the zero NPV investment condition (all else equal). See for example Schmalansee, *An expository note on depreciation and profitability under rate of return regulation*, Journal of Regulatory Economics, 1989, 1, pp. 293–298.

[1193] Brennan, *Depreciation, investor compensation and, welfare under rate-of-return regulation*, Review of industrial organisation, 1991, 6, p. 75.

With regard to investor compensation, the basic goal of regulation is to give investors an income stream just sufficient to cover the costs of their assets, and no more

On-the-day approach

For simplicity, assume the term of the risk free rate matches the regulatory period (five years) under the on-the-day approach.[1194] If we provide service providers with a reasonable opportunity to recover at least efficient costs over a regulatory period commencing year t, then the present value of expected net operating cash flows over this period plus the closing RAB (at $t+5$) should equal the opening RAB (at t). Under our depreciation assumptions, the opening RAB (at t) will equal its initial value (at $t=0$).

This present value principle should hold under the on-the-day approach because we reset the allowed rate of return to reflect the (appropriately benchmarked) prevailing market cost of capital ($r_{t,5}$)[1195] at the commencement of each regulatory period. We show this below:

$$PV_t = E\left[\frac{CF_{t+1}}{(1+r_{t,5})^1} + \frac{CF_{t+2}}{(1+r_{t,5})^2} + \frac{CF_{t+3}}{(1+r_{t,5})^3} + \frac{CF_{t+4}}{(1+r_{t,5})^4} + \frac{CF_{t+5}}{(1+r_{t,5})^5} + \frac{K_{t+5}}{(1+r_{t,5})^5}\right]$$

$$= K_{t-1}$$ [1196]

where the allowed rate of return (in the cash flows) equals $\hat{r}_{t,5}$,[1197] and the present value (at time $t+5$) of expected future cash flows over the remaining term of the RAB equals the closing RAB at the end of year $t+5$ (that is, $PV_{t+5} = K_{t+5}$).

Under our assumptions, $K_{t-1} = K_0$, and:[1198]

$$CF_i = r_i * K_{i-1} = \hat{r}_{t,5} * K_0$$

1194 In practice, we have used a 10 year term to estimate the allowed rate of return. Given interest rates on longer-term debt securities are often higher than those on shorter-term debt securities, this would lead to overcompensation all else being equal. However, we assume no material overcompensation given this excess allowance on the return on debt may compensate service providers for their hedging costs in relation to debt capital. And, in relation to the return on equity, we assume no material overcompensation given we use a MRP estimate which his partly reliant on historical MRP estimates, which are estimated using the yield to maturity on 10 year Commonwealth Government Securities (CGS).

1195 This is the weighted average cost of capital (WACC) for an investment with similar degree of risk as a service provider in the provision of regulated services, at time t. That is, $r_{t,5} = \frac{E}{V} * r(e)_{t,5} + \frac{D}{V} * r(d)_{t,5}$, where $\frac{E}{V}$ is the proportion of equity capital; $r(e)_{t,5}$ is the cost of equity; $\frac{D}{V}$ is the proportion of debt capital; and $r(d)_{t,5}$ is the cost of debt.

1196 This is the closing RAB at the end of year t-1, which equals the opening RAB at the beginning of year t.

1197 $\widehat{r_{t,5}}$ is our best estimate of the prevailing market cost of capital $r_{t,5}$. It consists of, $\widehat{r(e)}_{t,5}$—our best estimate of the prevailing market cost of equity $r(e)_{t,5}$; $\widehat{r(d)}_{t,5}$—our best estimate of the prevailing market cost of debt $r(d)_{t,5}$; 0.4—our best estimate of $\frac{E}{V}$; and 0.6—our best estimate of $\frac{D}{V}$.

1198 These assumptions are: we ignore changes to the capital stock and assume all initial capital is returned at the end of the term of the RAB.

$$= (\widehat{r(e)}_{t,5} * 0.4 * K_0) + (\widehat{r(d)}_{t,5} * 0.6 * K_0),\ \ for\ i = t+1, \dots, t+5$$

$$K_{t+5} = K_0$$

We can show $PV_{t+5} = K_{t+5}$ $(= K_0)$ through the following sequences of equalities, which collapse down to PV_{t+5}:[1199]

$$PV_{t+5} = E\left[\sum_{i=t+6}^{t+10} \frac{CF_i}{(1+r_{t+5,5})^{i-5}} + \frac{K_{t+10}}{(1+r_{t+5,5})^5}\right]$$

$$PV_{t+10} = E\left[\sum_{i=t+11}^{t+15} \frac{CF_i}{(1+r_{t+10,5})^{i-10}} + \frac{K_{t+15}}{(1+r_{t+10,5})^5}\right]$$

...

$$PV_{T-5} = E\left[\sum_{i=(T-4)}^{T} \frac{CF_i}{(1+r_{(T-5),5})^{i-(T-5)}} + \frac{K_T}{(1+r_{(T-5),5})^5}\right]$$

The above present value principle should hold under any regulatory period under the on-the-day approach, and therefore should hold over the term of the RAB, which would comprise of multiple regulatory periods.[1200] The allowed rate of return is reset to reflect the (appropriately benchmarked) prevailing market cost of capital at the commencement of each regulatory period. Therefore, the present (or market) value of the RAB is reset to its statutory value (or, under our assumptions, its initial value K_0) at the commencement of each regulatory period. This is supported by Partington and Satchell.[1201] To this extent, the regulatory regime under an on-the-day approach can be likened to a long term floating rate security where the allowed rate of return is the coupon rate, reset at the start of each regulatory period such that the present (or market) value of the bond equals its par (or face) value.[1202]

1199 These equalities hold under the expectation that the allowed rate of return is reset at the commencement of each regulatory period to reflect the prevailing market cost of capital at that time ($r_{t+5,5}$, $r_{t+10,5}$, etc.). However, these future rates are unknown at time t. Also, under our assumptions, $K_0 = D_1 + D_2 + \cdots + D_T = K_T$.

1200 The resetting of the allowed rate of return at the commencement of each regulatory period means the end-of-period closing RAB has a present value equal to its statutory value at that point in time. However, any cash flow with a present value equal to the statutory value of the end-of-period closing RAB K_{t+5} at that time (for example, a cash flow transitioning to a trailing average) should result in the equality holding.

1201 See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 17.

1202 For clarity, we make this analogy to demonstrate why the rate of return should be reset on each reset date. We do not consider our return on debt cash flows are equivalent to a floating rate bond or require the allowed rate of return to be determined as such. We consider our benchmarked return on debt and return on equity estimates reasonably reflects the prevailing cost of debt and cost of equity for an investment with a similar degree of risk as a service provider in providing regulated services.

We consider this section shows the on-the-day approach provides service providers with a reasonable opportunity to recover at least efficient costs.[1203] That is, at the commencement of each regulatory period, the present value of expected future cash flows will equal the RAB. We note that given the ARORO is standalone, the ARORO will be achieved if the present value of expected return on (and of) capital cash flows equal the start-of-period opening RAB.

Trailing average approach

Under the trailing average approach, the service provider would not necessarily have a reasonable opportunity to recover at least efficient costs over a regulatory period. However, the service provider would still have a reasonable opportunity to recover at least efficient costs over the term of the RAB.

Assume we set the allowed rate of return based on a trailing average return on debt for a particular regulatory period (commencing year t). As set out above, for the present value principle to hold over the regulatory period commencing year t, the present value of expected net operating cash flows over this period plus the closing RAB (at $t+5$) should equate to the opening RAB (at t). Under our depreciation assumptions, this should result in the opening RAB (at t) being equal to its initial value (at $t=0$). That is, for the present value principle to hold over a regulatory period commencing year t, the following equality must hold:

$$PV_t = E\left[\frac{CF_{t+1}}{(1+r_{t,5})^1} + \frac{CF_{t+2}}{(1+r_{t,5})^2} + \frac{CF_{t+3}}{(1+r_{t,5})^3} + \frac{CF_{t+4}}{(1+r_{t,5})^4} + \frac{CF_{t+5}}{(1+r_{t,5})^5} + \frac{K_{t+5}}{(1+r_{t,5})^5}\right]$$

$$= K_{t-1} \ \ (= K_0)$$

where, under an immediate trailing average approach (under our assumptions):[1204]

$$CF_i = r_i * K_{i-1} = r_i * K_0$$

$$= (\widehat{r(e)}_{t,5} * 0.4 * K_0) + (0.1 * \textstyle\sum_{s=i-10}^{i-1} [r_{s,10}] * 0.6 * K_0), \ \ for\ i = t+1, \dots, t+5$$

The above equality is unlikely to hold for any given regulatory period. The only way this can hold is if the geometric average allowed rate of return used over the period equals $r_{t,5}$,[1205] and $PV_{t+5} = K_{t+5}$ (which equals K_0 under our assumptions).

1203 Assuming the correct discount rate (or cost of capital) is used to benchmark the allowed rate of return (and therefore reset the RAB to its statutory value) at each reset date.

1204 The allowed rate of return (r_i) is no longer an estimate of the prevailing market cost of capital $r_{t,5}$. The allowed rate of return consists of $\widehat{r(e)}_{t,5}$—our best estimate of the prevailing market cost of equity $r(e)_{t,5}$; 0.1*$\sum_{s=i-10}^{i-1} [r_{s,10}]$—a 10 year historical average cost of debt that is updated annually; 0.4—our best estimate of $\frac{E}{V}$; and 0.6—our best estimate of $\frac{D}{V}$.

1205 We consider this is consistent with Partington and Satchell's view that, 'if all future cash flows are positive, then there is a unique solution for the rate of return that sets the NPV to zero' (over each regulatory period). Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 45.

Despite this, we can show the service provider would have a reasonable opportunity to recover at least efficient costs over the term of the RAB. We previously observed that the on-the-day approach can be likened to a long term floating rate security where the coupon rate is reset to reflect the prevailing market cost of capital at the start of each regulatory period. Similarly, we can interpret the trailing average approach as 10 long term floating rate securities each covering a 10 per cent 'investment portion' in the RAB where the coupon rate is reset to reflect the prevailing market cost of (debt) capital every 10 years.

There are three different components to the trailing average approach: the transition in, the full staggered portfolio, and the transition out at the end of the investment horizon (or end of the term of the RAB). We show these below.

The allowed return on equity continues to be reset to reflect the prevailing market cost of equity at the commencement of each regulatory period. Therefore, we can reasonably assume the present value of expected return on equity cash flows equals the equity financed component of the RAB each regulatory period, although Partington and Satchell note there are likely to be complications associated with leverage.[1206] Because of this, in the following sections we focus on the return on debt cash flows and assume, for simplicity, the RAB is 100 per cent debt financed.

Transition into the staggered portfolio

On the first year of a trailing average, a business would either:

- Raise an equal-weighted portfolio of 1, 2, 3 ... 9, 10 year debt. Each year 10 per cent of this would expire and the business would replace this with 10 year debt.
- Raise 10 year debt. Each year it would refinance 10 per cent of this and replace this with more 10 year debt.

We have calculated the return on debt allowance assuming the latter option. Since we expect this would be the higher cost option given interest rates on longer-term debt securities are often higher than those on shorter-term debt securities, our debt allowance should be conservative in the service providers' favour.

Valuing the return on debt allowance using the first of the two options would be expected to provide a benchmark efficient entity a reasonable opportunity to recover at least efficient costs for its initial investment at $t = 0$ as this would allow the following equality to hold:[1207]

1206 That is, they consider it is likely that the 'cost of equity will diverge from that assumed at a 60% leverage level'. See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 21.

1207 We have used spot rates $r_{0,t}$ to discount the cash flows for years t=1 to t=10 because the debt portfolio consists of debt with different maturities. The cost of (debt) capital in this case is a complicated average of the spot rates.

$$PV_0 = E\left[\frac{1*CF_1+0.1*K_1}{(1+r_{0,1})^1} + \frac{0.9*CF_2+0.1*K_2}{(1+r_{0,2})^2} + \cdots + \frac{0.2*CF_9+0.1*K_9}{(1+r_{0,9})^9} + \frac{0.1*CF_{10}+0.1*K_{10}}{(1+r_{0,10})^{10}}\right] = K_{-1}$$ [1208]

where, under our assumptions:[1209]

$$CF_i = r_i * K_{i-1} = r_i * K_0$$

$$= \frac{1}{11-i}\sum_{j=i}^{10}[r_{0,j}] * K_0, \;\; for\ i = 1, 2, 3, \dots, 10$$

$$0.1 * \left(\sum_{i=1}^{10} K_i\right) = K_0.$$

As demonstrated under 'On-the-day approach', this equality holds because, for each one-tenth portion of the RAB:

- the expected net operating cash flows are, effectively, based on an allowed rate of return that reflects prevailing market rates at year $t = 0$, with the expectation that the allowed rate of return will be periodically reset to prevailing market rates
- the present (or market) value of the closing RAB (portion) at the end of each 'reset period' equals its statutory value.

For example, at $t = 0$, portion one of the initial RAB is financed through debt with a term of one year. The present value of expected net operating cash flows generated from portion one of the RAB plus portion one of the closing RAB at $t = 1$, should equal portion one of the opening RAB at $t = 0$. This is because it is expected that, at $t = 1$, we reset the allowed rate of return on portion one of the RAB to reflect the prevailing market cost of capital, and continue resetting every ten years (see equalities under 'The staggered portfolio' and 'End of the term of the RAB' below).

Similarly, at $t = 0$, portion two of the initial RAB is financed through debt with a term of two years, and the present value relationship holds for portion two over the two year period. The same logic applies to portions three to ten.

What this shows, is that at the beginning of the transition into a trailing average approach, the present value of expected future cash flows should equal the RAB (all else equal).

The staggered portfolio

A noted previously, the trailing average regime can be likened to 10 long term floating rate securities covering a 10 per cent 'investment portion' in the RAB where they receive the net operating cash flows generated from these investment portions. We

1208 This equals the opening RAB at the beginning of year 0—because the opening RAB at the beginning of year t equals the closing RAB at the end of year t-1.

1209 The allowed rate of return (r_i) is an average of estimates of the spot rates (at time 0) for different terms. The allowed rate of return differs each year because the proportion of expected net operating cash flow allocated to this debt portfolio reduces as each tranche of debt matures and the staggered portfolio is formed (see next section).

refer to these portions[1210] as $p1$ to $p10$. From $t = 1$ to $t = 10$, the present value relationships can be presented as:

$$PV[p1]_1 = E\left[\frac{0.1*CF_2}{(1+r_{1,10})^1} + \frac{0.1*CF_3}{(1+r_{1,10})^2} + \cdots + \frac{0.1*CF_{10}}{(1+r_{1,10})^9} + \frac{0.1*CF_{11}}{(1+r_{1,10})^{10}} + \frac{0.1*K_{11}}{(1+r_{1,10})^{10}}\right] = 0.1 * K_0$$ [1211]

$$PV[p2]_2 = E\left[\frac{0.1*CF_3}{(1+r_{2,10})^1} + \frac{0.1*CF_4}{(1+r_{2,10})^2} + \cdots + \frac{0.1*CF_{11}}{(1+r_{2,10})^9} + \frac{0.1*CF_{12}}{(1+r_{2,10})^{10}} + \frac{0.1*K_{12}}{(1+r_{2,10})^{10}}\right] = 0.1 * K_1$$

…

$$PV[p10]_{10} = E\left[\frac{0.1*CF_{11}}{(1+r_{10,10})^1} + \frac{0.1*CF_{12}}{(1+r_{10,10})^2} + \cdots + \frac{0.1*CF_{19}}{(1+r_{10,10})^9} + \frac{0.1*CF_{20}}{(1+r_{10,10})^{10}} + \frac{0.1*K_{20}}{(1+r_{10,10})^{10}}\right] = 0.1 * K_9$$

where the expected net operating cash flow generated each year from portions 1 to 10 of the RAB is based on the portion of the allowed rate of return that reflects the prevailing market cost of capital at time 1 to 10 respectively;[1212] that is:[1213]

$$0.1 * CF_i = \hat{r}_{t,10} * 0.1 * K_t,\ for\ t = 1, \ldots, 10\ and\ i = 2, \ldots, 20$$

and, under our assumptions, $K_t = K_0$.

As demonstrated under 'On-the-day approach', the above equalities hold because, for each portion of the RAB:

- the expected net operating cash flows are, effectively, based on an allowed rate of return that reflects prevailing market rates at year $t = 1 \ldots 10$ respectively, with the expectation that the allowed rate of return will be reset to prevailing market rates every ten years
- the present (or market) value of the closing RAB (portion) at the end of each 'reset period' equals its statutory value.

In this way, the staggered portfolio can be seen as ten on-the-day approaches on ten portions of the RAB. Therefore, for each portion of the RAB, the present value of expected net operating cash flows over the ten year 'reset period' plus the closing RAB (portion) at $t + 10$ should equal the opening RAB (portion) at t.

We also note that while Partington and Satchell recommend the on-the-day approach, they acknowledge 'since the trailing average approach resets one tenth of the cost of

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[1210] Or, the expected cash flows generated from these portions.

[1211] The opening RAB at the beginning of year t equals the closing RAB at the end of year t-1.

[1212] In likening this approach to ten long term floating rate securities, the proportion of expected net operating cash flow generated each year from portions 1 to 10 of the RAB can be seen as the fixed interest payments on the ten securities. One security is issued (at par value) each year 1 to 10 and the interest rate on each equals the prevailing market cost of capital at the time of issuance, until it is reset in ten years.

[1213] Where $\hat{r}_{t,10}$ is our best estimate of the prevailing market cost of (debt) capital at time t ($r_{t,10}$). We note this represents only one tenth of the trailing average rate of return (on debt).

debt to the market rate each year, the compensation is correctly set for one tenth of the debt each year'.[1214]

End of the term of the RAB

Nearing the end of the term of the RAB, the business must wind up its debt fund, which can be likened to 10 long term floating rate securities covering a 10 per cent 'investment portion' in the RAB. At $t = T - 10$, the business could either:[1215]

- Raise 9, 8 … 2, 1 year debt on a staggered basis. All its debt would thus expire in year T and it would repay the entire initial value of the RAB back to its investors.
- Allow its staggered portfolio to gradually expire, repaying 10 per cent of the initial value of the RAB to investors each year.

This means our return on debt allowance would have to allow for a transition out of the staggered portfolio. Valuing the return on debt allowance using the first of the two options would be expected to provide a benchmark efficient entity a reasonable opportunity to recover at least efficient costs as this would allow the following equalities to hold (from $t = T - 10$ to $t = T - 1$):

$$PV[p1]_{T-10} = E\left[\frac{0.1*CF_{(T-9)}}{(1+r_{(T-10),9})^1} + \frac{0.1*CF_{(T-8)}}{(1+r_{(T-10),9})^2} + \cdots + \frac{0.1*CF_{1(T-1)}}{(1+r_{(T-10),9})8} + \frac{0.1*CF_T+0.1*K_T}{(1+r_{(T-10),9})^9}\right] = 0.1 * K_{T-11}$$ [1216]

$$PV[p2]_{T-9} = E\left[\frac{0.1*CF_{(T-8)}}{(1+r_{(T-9),8})^1} + \frac{0.1*CF_{(T-7)}}{(1+r_{(T-9),8})^2} + \cdots + \frac{0.1*CF_{1(T-1)}}{(1+r_{(T-9),8})7} + \frac{0.1*CF_T+0.1*K_T}{(1+r_{(T-9),8})^8}\right] = 0.1 * K_{T-10}$$

…

$$PV[p10]_{T-1} = E\left[\frac{0.1*CF_T+0.1*K_T}{(1+r_{(T-1),1})^1}\right] = 0.1 * K_{T-2}$$

where the proportion of net operating cash flow generated from each portion of the RAB each year equals the interest payment on that tranche of debt; that is:[1217]

$$0.1 * CF_i = \hat{r}_{t,10} * 0.1 * K_t,\ for\ t = T-10, \ldots, T-1\ and\ i = T-9, \ldots, T$$

and, under our assumptions, $K_t = K_0$.

As shown in the above sections, the above equalities hold because, for each portion of the RAB:

- the expected net operating cash flows are, effectively, based on an allowed rate of return that reflects prevailing market rates at year $t = T - 10 \ldots T - 1$ respectively

1214 Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 17.

1215 Note we ignore the treatment of changes to the capital stock before the end of the assets life (where we assume all capital is returned).

1216 The opening RAB at the beginning of year t equals the closing RAB at the end of year t-1.

1217 Where $\hat{r}_{t,10}$ is our best estimate of the prevailing market cost of (debt) capital at time t $r_{t,10}$.

- the present (or market) value of the closing RAB (portion) at the end of each period equals its statutory value.

Given these equalities hold, the service provider would expect to have a reasonable opportunity to recover at least efficient costs for each of its investment portions. Since this applies to all stages of the trailing average approach, the service provider would expect to have a reasonable opportunity to recover at least efficient costs over the entire term of the RAB.

The sections above show that the key distinction between an on-the-day and a trailing average approach is:

- the on-the-day approach results in the entire allowed rate of return being reset to reflect prevailing market (or efficient) rates near the commencement of the regulatory period
- the trailing average approach results in one tenth of the allowed rate of return being reset to reflect prevailing market (or efficient) rates each year.

However, both approaches to setting the allowed rate of return, if appropriately implemented (in a forward looking manner) should result in the same ex-ante compensation for a benchmark efficient entity's ex-ante efficient financing costs over the term of the RAB.

H.4 A full transition satisfies the ARORO

If moving from the on-the-day to the trailing average approach, we consider a full transition is required to meet the ARORO and the objectives of the NEL/NGL. A full transition is revenue neutral in a present value sense.[1218] Assuming the on-the-day or trailing average approach would contribute to the achievement of the ARORO, a revenue neutral transition will also contribute to the achievement of the ARORO.

As shown in section H.3.3, ex-ante efficient compensation can hold under either the on-the-day approach or the trailing average approach (if a transition is applied). As such, both approaches are capable of being approximately equivalent over the term of the RAB (which will be multiple regulatory periods).

For this reason, setting the return on debt allowance under the assumption that the service provider does not instantly have a trailing average debt portfolio, but rather has to develop, it should neither have a positive or negative affect on the service provider. Rather, we expect this would be NPV neutral.

We show in section H.3.3 that under the trailing average approach, service providers expect to have a reasonable opportunity to recover at least efficient financing costs

[1218] Wherever we say revenue neutral we mean revenue neutral in a present value sense. This is equivalent to avoiding wealth transfers from the change in methodology. This is also equivalent to saying there are no windfall gains or losses from the change in methodology (as HoustonKemp appear to use the term in their advice to ESCOSSA).

over the term of the RAB. However, for any given regulatory period, the present value of expected net operating cash flows over the regulatory period plus the closing RAB will not necessarily equal the opening RAB. That is, at the start of any given regulatory period, the present value of expected future cash flows will unlikely equal the RAB because the cash flows based on historical interest rates will either be higher or too low (relative to the prevailing cost of debt in the market). Given this, switching between regimes without a full transition would not satisfy the requirement to provide service providers with a reasonable opportunity to recover at least efficient costs over either the regulatory period or over the term of the RAB.

H.5 An immediate (or hybrid) transition will not satisfy the ARORO

We consider a full transition to a trailing average will result in an ex-ante reasonable return and would contribute to the achievement of the ARORO (see section H.4). Conversely, we do not consider that an immediate (or hybrid) transition to a trailing average will result in an ex-ante reasonable return and would contribute to the achievement of the ARORO. This is because these approaches are not revenue neutral (in a present value sense). Rather, because these approaches would not be revenue-neutral, these would result in ex-ante overcompensation if moving from a high to a low interest rate environment. Conversely, these would result in ex-ante undercompensation if moving from a low to a high interest rate environment. We show the difference between our approach and the service providers' proposed approach mathematically in section H.5.1.

It is also worth noting that while stakeholders generally supported moving to a trailing average approach when we developed the Guideline, the trailing average cannot be considered in isolation of the transition set out in the Guideline.[1219] This is supported by the CCP3 in advising:[1220]

> consumer acceptance for the 10-year trailing average cost of debt (rather than continuation of the “on-the-day” or a 5-year trailing average aligned with the regulatory period) during the Better Regulation process was, arguably, contingent on the AER having an effective transition process that would prevent windfall gains or losses by either consumers or the businesses. The DNSPs’ revised proposals for transition violate this implicit understanding that has underpinned the consumers’ support of the 10-year rolling average approach.

[1219] The change in the return on debt approach and the associated transition were necessarily discussed, consulted on and determined upon together. See AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 98–125; AER, *Explanatory statement to the draft rate of return guideline*, August 2013, pp. 73–97; AER, *Consultation paper: Rate of return guidelines*, May 2013, pp. 49–55.

[1220] CCP3, *Submission to the AER: Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for revenue reset for the 2016–20 regulatory period*, 25 February 2016, p. 109.

For this reason, the CCP3 also advised that, 'the significant impact on consumers of the DNSPs' proposed departure from the RoR Guideline risks a collapse in consumer confidence in the regulatory process'.[1221]

Moreover, Partington and Satchell advise that, given a move to the trailing average approach, our full transition is preferable to an immediate (or hybrid) transition.[1222] They also state that:[1223]

> …it is appropriate in the present case, of significant divergence between the trailing average and the current cost of debt, that a transition should be made to the trailing average rather than immediately moving to full implementation.

Consequently, we consider the on-the-day approach should continue in the absence of a full transition to the trailing average approach. This is because the on-the-day approach produces a return on debt estimate that, in conjunction with the return on equity, satisfies the ARORO. As shown in section H.3.3, the on-the-day approach provides ex-ante efficient compensation for a benchmark efficient entity's efficient cost of financing over each regulatory period and over the term of the RAB.

H.5.1 Mathematical explanation

This section demonstrates the difference (in present value terms) between our full transition and the service providers' immediate transition to the trailing average approach. We use the following notation:

- PV_t denotes present value, at year t
- $E[.]$ denotes expected value
- K_t is the closing RAB at the end of year t (which equals the opening RAB at the beginning of year $t+1$).
- 0.6 is the proportion of the RAB that is debt financed
- rd_t are the estimates of the return on debt used to calculate the return on capital cash flows
- $r_{t,j}$ is the (spot) discount rate at year t for a term of j years.

The present value of our proposed return on debt allowance over the next ten years (under a full transition) at time $t=0$ is as follows:[1224]

[1221] CCP3, *Submission to the AER: An overview —Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for revenue reset for the 2016–20 regulatory period*, 22 February 2016, p. 35.

[1222] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 52.

[1223] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 45–46.

[1224] This example does not consider expected allowed return on debt cash flows beyond year ten because beyond year ten the expected cash flows of the AER and the service providers are the same (in relation to the issue of transition only).

$$PV[AER]_0 = \frac{rd_0 \times 0.6 \times K_0}{(1+r_{0,1})^1}$$

$$+ \frac{(rd_0 \times 0.9 + E[rd_1] \times 0.1) \times 0.6 \times E[K_1]}{(1+r_{0,2})^2}$$

$$+ \frac{(rd_0 \times 0.8 + E[rd_1] \times 0.1 + E[rd_2] \times 0.1) \times 0.6 \times E[K_2]}{(1+r_{0,3})^3}$$

$$+ \cdots$$

$$+ \frac{0.1 \times (rd_0 + E[rd_1 + rd_2 + rd_3 + rd_4 + rd_5 + rd_6 + rd_7 + rd_8 + rd_9]) \times 0.6 \times E[K_9]}{(1+r_{0,10})^{10}}$$

The present value of the service providers' proposed return on debt allowance over the next ten years (under an immediate transition) at time $t = 0$ is as follows:

$$PV[SP]_0 = \frac{0.1 \times (rd_0 + rd_{-1} + rd_{-2} + rd_{-3} + rd_{-4} + rd_{-5} + rd_{-6} + rd_{-7} + rd_{-8} + rd_{-9}) \times 0.6 \times K_0}{(1+r_{0,1})^1}$$

$$+ \frac{0.1 \times (E[rd_1] + rd_0 + rd_{-1} + rd_{-2} + rd_{-3} + rd_{-4} + rd_{-5} + rd_{-6} + rd_{-7} + rd_{-8}) \times 0.6 \times E[K_1]}{(1+r_{0,2})^2}$$

$$+ \frac{0.1 \times (E[rd_2] + E[rd_1] + rd_0 + rd_{-1} + rd_{-2} + rd_{-3} + rd_{-4} + rd_{-5} + rd_{-6} + rd_{-7}) \times 0.6 \times E[K_2]}{(1+r_{0,3})^3}$$

$$+ \cdots$$

$$+ \frac{0.1 \times (rd_0 + E[rd_1 + rd_2 + rd_3 + rd_4 + rd_5 + rd_6 + rd_7 + rd_8 + rd_9]) \times 0.6 \times E[K_9]}{(1+r_{0,10})^{10}}$$

Subtracting the present value of our return on debt allowance over the next ten years from the present value of the service providers' proposed return on debt allowance over the next ten years gives the following difference in present value terms:

$$PV[SP]_0 - PV[AER]_0$$

$$= \frac{(0.1 \times (rd_{-1} + rd_{-2} + rd_{-3} + rd_{-4} + rd_{-5} + rd_{-6} + rd_{-7} + rd_{-8} + rd_{-9}) - 0.9 \times rd_0) \times 0.6 \times K_0}{(1+r_{0,1})^1}$$

$$+ \frac{(0.1 \times (rd_{-1} + rd_{-2} + rd_{-3} + rd_{-4} + rd_{-5} + rd_{-6} + rd_{-7} + rd_{-8}) - 0.8 \times rd_0) \times 0.6 \times E[K_1]}{(1+r_{0,2})^2}$$

$$+ \frac{(0.1 \times (rd_{-1} + rd_{-2} + rd_{-3} + rd_{-4} + rd_{-5} + rd_{-6} + rd_{-7}) - 0.7 \times rd_0) \times 0.6 \times E[K_2]}{(1+r_{0,3})^3}$$

$$+ \frac{(0.1 \times (rd_{-1} + rd_{-2} + rd_{-3} + rd_{-4} + rd_{-5} + rd_{-6}) - 0.6 \times rd_0) \times 0.6 \times E[K_3]}{(1+r_{0,4})^4}$$

$$+ \frac{(0.1 \times (rd_{-1} + rd_{-2} + rd_{-3} + rd_{-4} + rd_{-5}) - 0.5 \times rd_0) \times 0.6 \times E[K_4]}{(1+r_{0,5})^5}$$

$$+ \frac{(0.1 \times (rd_{-1} + rd_{-2} + rd_{-3} + rd_{-4}) - 0.4 \times rd_0) \times 0.6 \times E[K_5]}{(1+r_{0,6})^6}$$

$$+ \frac{(0.1 \times (rd_{-1} + rd_{-2} + rd_{-3}) - 0.3 \times rd_0) \times 0.6 \times E[K_6]}{(1+r_{0,7})^7}$$

$$+\frac{(0.1\times(rd_{-1}+rd_{-2})-0.2\times rd_0)\times 0.6\times E[K_7]}{(1+r_{0,8})^8}$$

$$+\frac{(0.1\times(rd_{-1})-0.1\times rd_0)\times 0.6\times E[K_8]}{(1+r_{0,9})^9}$$

$$+0$$

We can conclude several things from the above calculation in relation to the expected return on debt allowance:

- Assuming you use the same data series, term and credit rating, the difference between our proposed return on debt allowance and the service providers' proposed return on debt allowance is a fixed amount in each of the first nine years.[1225]
- Assuming you use the same data series, term and credit rating, there is no difference between our proposed return on debt allowance and the service providers' proposed return on debt allowance from year ten onwards.
- The present value of the difference in our proposed return on debt allowance and the service providers' proposed return on debt allowance for each of the next nine years can be calculated today.[1226] This total present value is a sum of the difference in values for each of the next nine years (as shown above).
- Given that current interest rates are well below average historical rates over the last nine years, the service providers' proposed return on debt allowance will have a materially higher present value than our proposed return on debt allowance (over both the upcoming regulatory period and the next nine years). For the reasons discussed earlier, this is inconsistent with the zero NPV investment condition and will not meet the ARORO or NEO/NGO. It is worth noting that current interest rates could have similarly moved above historical rates and this would have required a transition to avoid undercompensating a benchmark efficient entity.

We note that although the service providers have proposed an immediate transition, many have also proposed a partial hybrid transition as a second preference to their proposals (explained in section H.5.2).[1227] Under these proposed alternative approaches the above propositions also hold (that is, the difference in each year will be a fixed amount that can be quantified and valued), although the difference in each of

[1225] We note the exact amount in each year is impacted by the forecast capital investment and depreciation. However, these forecasts will impact both the AER's allowance and the NSPs proposed allowance as shown above, and the difference will still be a fixed amount which is a function of the known RAB at time 0 and the expected RAB at time 1 to 8.

[1226] This assumes you have forecasts for the RAB at time 1 to 8. This may not be realistic for time 6 onwards (i.e. beyond the end of the current regulatory control period). However, even in the absence of RAB forecasts for yeas 6 to 10 a reasonable approximation of the present value difference can be made today.

[1227] AGN also proposed a full hybrid transition as a third preference. AGN, Attachment 10.26, *Response to draft decision: Rate of return*, January 2016, p. 7.

the next nine years between our approach and the service providers' proposed approach will differ depending on the approach proposed.

In relation to the risk associated with the alternative return on debt allowances, the key interest rate risk associated with the allowed return on debt cash flow streams in each future year appears to come from rolling future interest rates into the trailing average. As all proposed allowances roll the same future interest rates in at a rate of 1/10 per year, the risk associated with the uncertainty from these rates should be the same across transition approaches. This implies that any mismatch risk associated with future interest rate uncertainty might be expected to be the same or similar under all transition approaches.[1228]

This above analysis implies the key difference between our proposed return on debt allowance and the service providers' alternatives appears to be fixed changes in the present value of a benchmark efficient entity from the change in methodology. This change in value would represent a transfer between a benchmark efficient entity's shareholders and consumers, which would vary in quantum depending on the particular transition proposed. Partington and Satchell support this view, stating:[1229]

> It is also clear that the change to a trailing average if fully implemented immediately has substantial wealth effects. Substantial wealth transfers, whether to or from the regulated businesses, simply as a consequence of a relatively sudden regulatory change is undesirable.

H.5.2 Revised regulatory proposals

Initially, the service providers currently under assessment proposed a 'hybrid transition'. This combined a 10 year transition of the base rate into a trailing average approach with a backwards looking trailing average DRP.

In their revised regulatory proposals, these services providers have changed their preferences towards immediately adopting a backwards looking trailing average approach. However, they generally also submitted a second preference for a hybrid transition under partial hedging.[1230] The hybrid transition under partial hedging entails assuming a benchmark efficient entity hedged one third of the base rate and only transitioning this component of the return on debt.[1231] We do not agree with the reasons provided for adopting either of these preferences, which we respond to separately in the following sections.

[1228] Noting we do not consider if there was a lesser mismatch under one approach it would justify an approach that did not result in an efficient (forward looking) return on debt allowance.

[1229] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 52.

[1230] The exceptions were: APTNT, which only proposed no transition and AGN proposed a full hybrid transition as its third preference.

[1231] In the revised proposals that put Option 5 before us, $x = 1/3$ based on CEG, *Critique of the AER's approach to transition*, January 2016, p. 2.

It is also worth noting that this change in service providers' positions results in a notable increase in the allowed return on debt. The CCP3 submits that following this new position, service providers are now proposing a higher effective DRP than what they would have incurred during the Global Financial Crisis.[1232] It subsequently advises:[1233]

> CCP3 does not consider that the DNSPs' revised RoD proposals for 2016-20 reflect a reasonable expectation of their current overall efficient debt portfolio costs; nor do the RoD proposals reflect expected future debt costs.

Proposals for immediately adopting a trailing average

Service providers submitted a range of (often interrelated) reasons for supporting the change in preference seen in their revised proposals towards immediately transitioning to a trailing average. We do not agree with the logic driving this change in preference, which Table 3-41 addresses.

Table 3-41 AER view of reasons in revised regulatory proposals

Reason provided in revised regulatory proposals	AER view
An immediate (or hybrid) transition is consistent with a historically-based definition of efficient financing costs.	We do not consider 'efficient financing costs' in the ARORO refers to historical costs, requiring compensation for losses (or gains) from unhedged mismatch with the previous regulatory allowance. Rather, achieving the ARORO requires a benchmark efficient entity be ex-ante appropriately compensated in present value terms and for the allowance to lead to efficient compensation (see section H.2.1). If provided with ex-ante efficient compensation, then a benchmark efficient entity has a reasonable opportunity to recover its efficient debt financing costs. The on-the-day rate is an appropriate measure of 'efficient financing costs' and reflects the prevailing cost of debt in the capital market near the commencement of the regulatory period. This is consistent with the cost of capital being a forward-looking opportunity cost (see section H.1.1).[1234] The trailing average approach can also reflect prevailing market rates because one-tenth of the historical average is updated each year to reflect prevailing market rates (see section H.3.3). However, it is important to transition into this approach in a forward-looking manner using efficient prevailing market rates (as our full transition does). Without this, we would be providing an allowance based on historical costs, which unless by chance, will differ from prevailing (or

[1232] CCP3 submits that service providers are proposing an effective DRP of approximately 5.1%. In contrast, data suggests that the historical average DRP was in the order of 2.35% for BBB rated companies. Even during the GFC, the DRP was less than 4.5%. See CCP3, *Submission to the AER: An Overview — Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for a revenue reset for the 2016-2020 regulatory period* , 22 February 2016, p. 34

[1233] CCP3, *Submission to the AER: Response to AER Preliminary Decisions and revised proposals from Victorian electricity DNSPs for a revenue reset for the 2016-2020 regulatory period* , 25 February 2016, p. 104

[1234] It is useful to note that our trailing average reflects prevailing market rates (in part) because one-tenth of the average is updated each year to reflect prevailing market rates. In this way, a benchmark efficient entity's debt fund under a trailing average approach could be seen as 10 floating rate bonds that are raised on a staggered basis and reset to par every 10 years (see H.3.3 for a mathematical depiction).

	current) market rates and is therefore not reflective of efficient costs.
Immediately implementing a trailing average (in whole or part) would reduce the ex-post 'mismatch' between the allowed return on debt cash flows and a benchmark efficient entity's actual (historical) debt costs (or cash outflows).[1235]	As discussed in section H.2.1, some mismatch between the allowed return on debt cash flows and a benchmark efficient entity's actual (historical) debt costs is expected under an ex-ante regime and this is consistent with the ARORO. However, we do not consider that removing the realisations of mismatch risk ex-post would meet the requirement to appropriately compensate a benchmark efficient entity (ex-ante) for its efficient financing costs. This is particularly because we ex-ante compensate a benchmark efficient entity for bearing this risk.[1236] We consider that under ex-ante regulation, we are required to have regard to the desirability of reducing the risk of a mismatch (going forward).[1237] In contrast to what service providers suggest, we are not required to remove a mismatch that has eventuated (ex-post). Ex-post mismatch reflects the realisation of interest rate risk that has already occurred and cannot be hedged.[1238] The equity value of the service providers we regulate should already reflect the value of any losses (or gains) from interest rate movements.[1239] We consider the desirability of reducing mismatch risk is only applicable to new debt. All proposed approaches (immediate, hybrid and full transition) have 10 per cent of the allowed return on debt reset each year (see section H.5.1). Therefore, all proposed approaches should have the same exposure to future interest rate risk and result in the same level of genuine mismatch risk from changes in future interest rates.
An immediate transition to a trailing average is consistent with outcomes in a workably competitive market	Given the current market (and efficient) cost of debt is below the average market cost of debt over the past ten years, service providers' proposed transition paths would not achieve ex ante efficient compensation in present

1235 ActewAGL, *Appendix 5.01 detailed response to rate of return, gamma and inflation*, January 2016, p. 33; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 34; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, p. 172; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 341; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 26; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 335; United Energy, *Revised regulatory proposal: Response to AER preliminary decision—Re: rate of return and gamma*, January 2016, p. 32.

1236 Investors in the service provides we regulate have for many years had allowed debt cash flows set using the on-the-day approach and would have reasonably expected future debt cash flows (and associated risks) consistent with the on-the-day approach. To the extent t these risks were systematic, these would be priced into investors' required cost of equity, and we would compensate service providers for this given by using historical returns to calculate beta. We consider mismatch risk arises from interest rate risk because any difference between a benchmark efficient entity's costs of servicing its debt and the allowed return on debt is a function of unforeseen interest rate movements.

1237 NER, cl. 6.5.2(k)(1); NER, cl. 6A.6.2(k)(1); NGR, cl. 87(11)(a).

1238 As noted by SFG, it is not possible to hedge historical interest rates as businesses cannot access historical rates at the time they issue new debt (see SFG, *Rule change proposals relating to the debt component of the regulatory rate of return*, August 2012, pp. 32, 45). Similarly, Partington and Satchell stated, 'Once the change in value has occurred the original event cannot be hedged. We cannot change the past. Hedges have to be put in place before the events to be hedged have occurred' (Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 34).

1239 Partington and Satchell state '…changes in the value of a regulated firm's debt portfolio value occur when the market interest rates change. These changes lead to increases or decreases in the market value debt, which in turn affect the market value of the equity of the regulated firm at the same time as the market value of the debt changes' (see Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, p. 34). We also note the firms we regulate generally account for gains or losses from interest rate movements in their financial accounts where they use fair value accounting. See for example APA Group, *Annual report 2015*, p. 64; DUET Group, *Financial report 2015*, p. 63, Spark Infrastructure, *Annual Report 2013*, p. 62.

because unregulated infrastructure businesses tend to hold staggered debt portfolios. That is, because the intent of legislation is to replicate a workably competitive market, an immediate transition is necessary to replicate the (ex-post) cost outcomes that one would expect absent regulation.[1240]	value terms, based on prevailing efficient market rates. We do not consider this is consistent with any outcome that might be expected in a workably competitive market in general. In workably competitive markets, the costs of new entrants often set prices irrespective of incumbent firms' sunk costs, and the equilibrium is that investments in assets are zero NPV (see section H.3.1). Also, we consider the outcome that the regulated firms are currently seeking is only possible due to their monopoly position in providing essential services (which would not exist in a workably competitive market). Firms have limited bargaining power in a workably competitive market. As such, we do not consider that consumers in a workably competitive market would freely enter into a bargain that would result in an immediate transition. In the current market, this would constitute a change of methodology that materially increases the firm's value at the expense of its consumers.
CEG advised that incentives created by the on-the-day regime may not have resulted in efficient financing practices and may not be commensurate with 'efficient financing costs' referenced in the ARORO.[1241]	We observe that CEG did not indicate what it considered 'efficient financing costs' meant in the context of the ARORO. As explained in section H.2, we consider efficient financing costs in the context of the ARORO mean we must provide a benchmark efficient entity with ex ante efficient compensation in present value terms, based on prevailing efficient market rates. We consider our transition approach achieves this. Further, we consider an interpretation of the ARORO that leads to materially higher (or lower) compensation (in present value terms) is inconsistent with achieving efficient investment and the objectives of the NEL/NGL.
The AER should define a benchmark efficient entity as unregulated rather than regulated.[1242] An unregulated benchmark efficient entity is consistent with the intent of the law to replicate workably	Section 3.3 of the rate of return attachment discusses why we consider that defining a benchmark efficient entity as regulated is required to give effect to the rules and the NEL/NGL. Seeking to replicate the outcomes of a workably competitive market does not require defining a benchmark efficient entity as unregulated. Rather, it requires that we replicate the efficiency outcomes that we would expect under a workably competitive market (and the resulting prices and service levels).[1243]

[1240] ActewAGL, *Appendix 5.01 detailed response to rate of return, gamma and inflation*, January 2016, pp. 4–5,18; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 6; APA Group, *Amadeus Gas Pipeline access arrangement information*, January 2016, p. 24; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, p. 144–5; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 264–5; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. ix–x; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 258–9; United Energy, *2016 to 2020 revised regulatory proposal*, January 2016, p. 76–8.

[1241] CEG, *Critique of the AER's approach to transition*, January 2016, p. 1.

[1242] ActewAGL, *Appendix 5.01 detailed response to rate of return, gamma and inflation*, January 2016, p. 19; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 25; APA Group, *Amadeus Gas Pipeline access arrangement information*, January 2016, pp. 79–81; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, p. 7-21; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 331; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 16; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 325; United Energy, *2016 to 2020 revised regulatory proposal*, January 2016, p. 22.

[1243] The basis for desiring a competitive market outcome in microeconomic theory stems from the theorems that a competitive equilibrium is Pareto-efficient and any Pareto-efficient allocation can be decentralised as a competitive equilibrium. This is where, in microeconomic theory, a 'competitive market equilibrium' is where firms' maximise their profits, consumers maximise their utilities and the market clears (there is no waste or undersupply). See Mas-Colell, A., Whinston, M.D., Green, J.R., *Microeconomic theory*, Oxford University Press, 2006, p. 314. It is worth noting that these theorems are derived from strong assumptions including an absence of externalities and market power, price taking behaviour and symmetric information. See for example Varian, H.R., *Intermediate micro economics: A modern approach*, ed. 7, W.W. Norton &Company, 1987, pp. 585; Hindriks, J., Myles, G.D., *Intermediate public economics*, The MIT Press, 2006, pp. 12–13.

competitive market outcomes.	We consider our approach preferable for achieving efficiency outcomes expected in a workably competitive market. We consider our approach will promote productive efficiency because it is not expected to over- or under-compensate a benchmark efficient entity for its efficient cost of debt capital. This should also reduce regulatory uncertainty. We consider our approach will promote dynamic efficiency as we have designed our full transition so that methodological changes do not affect the value of the investment. This allows the investment to be appropriately valued to avoid directing excessive or insufficient resources towards network investment. Similarly, this promotes allocative efficiency by avoiding greater or fewer consumer resources being directed towards network investment than what consumers are willing to pay (thus maximises social welfare and allocative efficiency).
Efficient financing costs are properly identified by reference to financing practices that would be adopted in workably competitive markets.[1244]	We do not consider a benchmark efficient entity's past financing practices determine its efficient financing costs (although we note we benchmark current gearing, credit rating and debt term at issuance in determining a benchmark efficient entity's ex ante efficient allowed return on debt). Rather, we consider achieving the ARORO requires a benchmark efficient entity be ex-ante appropriately compensated for its efficient financing costs in present value terms, where efficient financing costs are based on prevailing market rates (see section H.2.1). However, we consider what may be a reasonable benchmark efficient financing practice (under a given regulatory approach) in having regard to the likelihood of an ex-post mismatch between a benchmark efficient entity's actual debt costs and the regulatory debt allowance (as the rules require). We discuss this in more detail below under 'Proposals for a hybrid approach based on partial hedging'. We note that Partington and Satchell also advise against interpreting the efficient financing costs as relating to some assumed financing strategy. They state a number of reasons to support their view, including that what constitutes a benchmark efficient financing practice is ambiguous.[1245]

Source: AER analysis, service providers' revised proposals and supporting material.

Proposals for a hybrid approach based on partial hedging

Several service providers submitted that if we do not accept their first preference to adopt an immediate transition, we should apply a hybrid transition based on the assumption that a benchmark efficient entity would only hedge one third of the base rate.[1246] In expressing this preference, these service providers assume it would have

[1244] ActewAGL, *Appendix 5.01 detailed response to rate of return, gamma and inflation*, January 2016, pp. 34–35; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, pp. 35–36; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, pp. 7-32–7-33; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 343; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 28; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 337; United Energy, *2016 to 2020 revised regulatory proposal*, January 2016, p. 33.

[1245] See Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 15–27.

[1246] ActewAGL, *Appendix 5.01 detailed response to rate of return, gamma and inflation*, January 2016, p. 19; AGN, *Attachment 10.26 response to draft decision: Rate of return*, January 2016, p. 25; AusNet Electricity Services, *Revised regulatory proposal*, January 2016, p. 7-21; CitiPower, *Revised Regulatory Proposal 2016—2020*, January 2016, p. 331; JEN, *Attachment 6-1 rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 16; Powercor, *Revised regulatory proposal 2016–20*, January 2016, p. 325; United Energy, *2016 to 2020 revised regulatory proposal*, January 2016, p. 22.

been optimal for a benchmark efficient entity to hedge one third (rather than 100 per cent) of the base rate under the on-the-day approach.[1247]

Under the on-the-day regime, there are multiple ways that service providers could finance their debt whilst still having a reasonable opportunity to recover at least efficient costs over the life of their assets. While hedging interest rate risk should not change a service provider's ability to recover at least efficient costs ex-ante, it affects its ability to recover its actual (historical) cost over any given regulatory period. We do not base our reasons for a full transition on actual (historical) debt costs or debt financing (or hedging) practices because we are operating under an ex-ante regulatory regime rather than a cost of service model (see Table 3-41 above).

Nevertheless, we reviewed the service providers' submissions and CEG's 2016 report in detail. We are not satisfied it is reasonable to assume (in isolation) the benchmark efficient financing strategy under the on-the-day approach involved hedging only one third of the base rate.

First, observed practices of regulated energy network firms appear more consistent with a benchmark assumption of 100 per cent hedging than one third hedging (of the base rate). For example, in the 2009 WACC review, we observed that Treasurers' statements and Macquarie Research indicated that typically businesses hedged the base interest rate risk for nearly 100 per cent of their debt portfolios at the time of the regulatory reset.[1248] More recently, we collected return on debt data from a number of regulated energy network service providers. This data corroborated our findings from the 2009 WACC review.[1249] Recent annual reports also show similar findings.[1250]

Second, we consider proposals to depart from specific aspects of our preferred benchmark efficient financing practices should not be viewed in isolation. CEG has assessed in isolation a more complex hedging strategy (of one third of the base rate) without regard to the other simplifications associated with our preferred benchmark efficient financing practice under the on-the-day approach. We are not satisfied that CEG's analysis shows our benchmark efficient financing practice under the on-the-day approach as a whole is unreasonable. CEG has not analysed the other simplifications we have employed in forming our view, and has not demonstrated that a more complex benchmark efficient financing practice (overall) leads to a materially preferable outcome. On the other hand, in forming its view that our proposed benchmark efficient financing practice is appropriate, Chairmont assessed a range of variations to this

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[1247] Based on CEG's advice in CEG, *Critique of the AER's approach to transition*, January 2016.

[1248] AER, *Review of WACC parameters: Final decision*, May 2009, p. 153; AER, *Review of WACC parameters: Explanatory statement*, December 2008, pp. 103–104.

[1249] Chairmont, *Financing practices under regulation: Past and transitional (Confidential)*, October 2015, pp. 73–80.

[1250] See for example APA Group, *Annual report 2015*, p. 14; DUET Group, *Financial report for year ended 30 June 2015* , p. 61; Envestra Ltd, *2014 annual report*, p. 26; Envestra Ltd, *Directors' and financial report*, 30 June 2014, p. 27; AusNet Services, *Statutory annual report 2015: We move energy*, p. 36; SP AusNet, *Business review 2014: SP AusNet Distribution financial report*, Note 19, p. 11; Spark Infrastructure, *The Australian infrastructure network specialists: Annual report 2014*, p. 7 (Spark does not currently engage in interest rate hedging, but over the previous two years have hedged almost 100% of their debt).

financing practice, including variations in hedging, term, and timing and type of debt issuance.[1251]

Third, we responded to submissions supporting an optimal hedging ratio of less than one third (including CEG's June 2015 report) in our recent decisions, based on advice from Lally and Chairmont.[1252] CEG has responded to Lally and Chairmont's advice in its most recent (2016) report. However, our reasons for a gradual transition in this decision are not based on the actual debt financing and/or hedging practices of service providers (efficient or not). Further, we consider the reasoning provided above is sufficient to show that 100 per cent hedging (of the base rate) is a reasonable benchmark. Therefore, we have not commissioned further advice from them in response to CEG's 2016 report.

Further, we do not consider an on-the-day approach would require compensation for swap transaction costs. Several service providers currently under assessment proposed to add an allowance for swap transaction costs to their return on debt each year if a hybrid transition (full or partial) is used.[1253] This is in line with CEG's advice (or references to Chairmont).[1254] We note that service providers request this allowance if we apply a hybrid transition to a trailing average.[1255] We maintain our view from our recent decisions.[1256] That is:

- We are not satisfied that customers should pay for the service providers' reduction in interest rate risk that results from hedging. CEG disputed our reference to a NERA report supporting this view because it considered the reference is only relevant under the old rules. CEG considered the current rules require a benchmark efficient entity to be compensated for the costs associated with its debt financing strategy.[1257] We disagree. We consider a rate of return that meets the

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[1251] Chairmont, *Financing practices under regulation: Past and transitional*, October 2015, pp. 9, 13.

[1252] See, for example, AER, *Preliminary decision: United Energy determination 2016 to 2020, Attachment 3 — Rate of return*, October 2015, pp. 555–558.

[1253] JEN, *Revised regulatory proposal: Attachment 6-1 Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 35, 41. See ActewAGL, *Revised access arrangement proposal: Appendix 5.01—Detailed response to rate of return, gamma and inflation*, January 2016, pp. 43, 45; AGN, *Revised access arrangement proposal: Attachment 10.26—Response to draft decision: Rate of return*, January 2016, pp. 9–10, 37–40, 87; CitiPower, *Revised regulatory proposal*, January 2016, p. 349–351; Powercor, *Revised regulatory proposal*, January 2016, p. 343–345.

[1254] Chairmont, *ERA Hedging costs in the cost of debt*, 13 May 2015; CEG, *Critique of the AER's approach to transition*, January 2016, pp. 63–64; CEG, *Memo– September 2015 cost of debt and inflation forecasts*, 5 January 2016.

[1255] On this basis, some service providers do not propose swap transaction costs. APTNT, *Amadeus Gas Pipeline access arrangement revised proposal: Response to draft decision*, January 2016; and United Energy, *Regulatory proposal*, April 2015 do not mention swap transaction costs. AusNet Services, *Revised regulatory proposal*, January 2016, p. 7-37 specifically stated it does not propose swap transaction costs because it proposes an immediate transition to a trailing average.

[1256] See, for example, AER, *Draft decision: Australian Gas Networks access arrangement 2016 to 2021*, November 2015, section G.1.6, p. 581.

[1257] CEG, *Critique of the AER's approach to transition*, January 2016, p. 1.

ARORO must provide for ex-ante efficient compensation (see section H.2), and this view does not invalidate our reference to the NERA report.

- Similarly, Partington and Satchell do not consider the transaction costs of hedging to be part of the efficient financing costs of a benchmark efficient entity that should be compensated for through the return on debt allowance. They consider hedging is a choice and firms will rationally choose to hedge when the benefits outweigh the costs, stating that this 'suggests the costs are covered by the value enhancement that results'.[1258]
- We agree with Lally's advice that hedging would have been self-funding because the saving in converting 10 year debt into five year debt would have offset the cost of the hedge. Moreover, there is wide support for the view that interest rates on longer-term debt securities are often higher than those on shorter-term debt securities.[1259] Therefore, even if we are incorrect in assuming hedging costs do not need compensation, we have effectively provided an allowance for these costs by using a ten year term on the base rate.

[1258] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 27, 31.

[1259] See, Peirson, Brown, Easton, Howard, Pinder, *Business Finance*, McGraw-Hill, Ed. 10, 2009, p. 95. Also see AER, *Rate of return guideline: Explanatory statement*, December 2013, pp. 138–139; NSW DNSP, *Submission on the rate of return draft guideline*, 11 October 2013, pp. 16–17; Ergon Energy, *Submission on the draft rate of return guidelines and explanatory statement*, 11 October 2013, p. 5; ENA, *Response to the draft rate of return guideline*, 11 October 2013, pp. 58–60.

I Return on debt implementation

This section sets out our detailed analysis of the key issues raised by stakeholders relating to the implementation of the return on debt approach. The analysis is set out in the following sections:

- the Thomson Reuters curve
- new criticisms of the BVAL curve
    - comparative movement of yield estimates
    - the Asciano bond
    - CEG's analysis of sample size
    - CEG's analysis of foreign bonds
- other issues
    - CEG's new criteria and weightings
    - analysis of mean squared error (MSE).
- averaging periods

Overall, we consider that much of this analysis indicates the shortcomings of annual testing or re-evaluation of the choice of data series at each decision stage. Much of the new analysis submitted prior to this decision is based on ex-post analysis of the performance of yield curves over a short averaging period. In contrast, we require service providers to specify averaging periods ahead of time because this avoids the introduction of bias into the analysis that can arise where the outcome of the choice is already known. Especially where this analysis is highly qualitative, we are not satisfied that this process can be automatically implemented by application of a formula.

Importantly, we must be satisfied that the approach that we adopt will continue to contribute to estimates which achieve the allowed rate of return objective for each annual update over the five year regulatory period. For this reason, we consider it is most critical that the approach we adopt is reasonable and fit for purpose over an extended period. At any points in time, it is possible that one curve or the other will better reflect the costs of the benchmark entity. However, for the reasons set out in this and previous decisions, we are not satisfied that there is a robust means to quantitatively identify which of the curves this is using the information currently before us. For this reason, our detailed analysis and expert advice focused on the underlying characteristics of the curve, their fitness for purpose, and their representativeness of the benchmark efficient entity. Having done so, we remain satisfied that a simple average of the BVAL and RBA curves will contribute to an estimate that achieves the allowed rate of return objective.

I.1 The Thomson Reuters curve

Our final decision is not to adopt the Thomson Reuters Curve for the following reasons:

- The Thomson Reuters curve was proposed for the first time in this revised proposal. This results in two distinct problems:
    - we have insufficient time to properly assess and consult on the Reuters curve. We discuss this in attachment 3.
    - at the time the service providers departed from their initial proposals, their averaging periods had either elapsed, were underway, or were about to commence. We are therefore not satisfied that the proposal is unbiased.
- From the limited assessment of the Thomson Reuters curve that we have been able to undertake in the time available, both the underlying characteristics and outcomes of the bond appear to be immaterially different from the existing combination. Therefore, even if the Thomson Reuters curve is fit for purpose, we are not persuaded that an approach which does not include this curve would fail to achieve the allowed rate of return objective. In these circumstances, we do not consider the information that has been submitted to us demonstrates that use of the Reuters curve would lead to a materially preferable NEO decision.

Nonetheless, we are open to further consideration of the Thomson Reuters curve in future determinations following a proper period of consultation.

I.1.1 Timing of proposal

The Thomson Reuters curve was submitted for consideration for the first time in the revised proposals. This left minimal time to run a robust process of analysis and consultation on the Thomson Reuters curve prior to publication of the final decisions. The process of assessing the Bloomberg and RBA curves took several stages of consultation between April 2014 until their use in a final decision in April 2015.[1260] This multi-stage process allowed detailed analysis from third party experts, as well as submissions from all affected stakeholders. In contrast, the service providers' proposal to adopt the Reuters curve allows significantly less time for analysis and consultation.[1261] Due to the uncertainty involved in 'locking in' a curve to generate estimates annually over the 5 year regulatory period, this consultation and analysis is critical in satisfying ourselves that the approach will achieve the rate of return objective. This notwithstanding, we have corresponded with Thompson Reuters and have assessed the curve to the fullest extent possible.

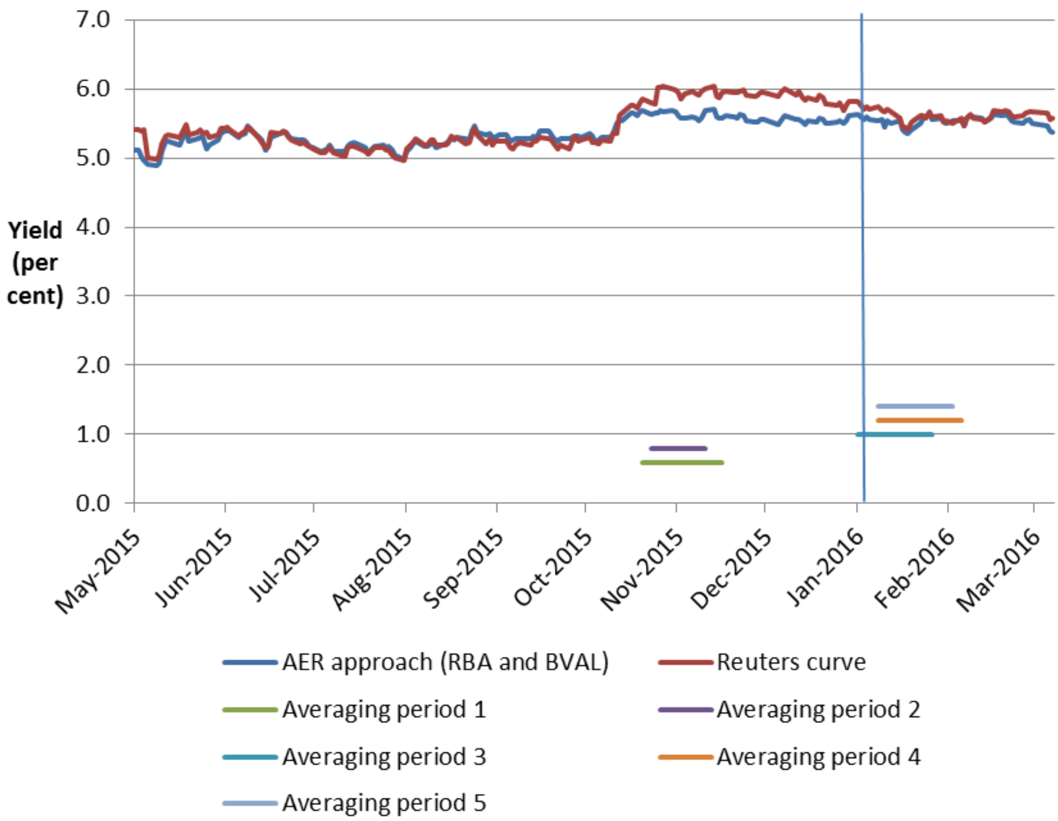
In addition, of the service providers that proposed to adopt the Reuters curve, their nominated averaging periods had either elapsed, commenced, or were scheduled to commence shortly after the submission of the revised proposal. This can give rise to bias. It is for this reason that we only accept averaging periods specified ahead of time.

[1260] AER, *Return on debt: Choice of third party data service provider—Issues Paper*, April 2014.

[1261] This is from the period that the revised proposals were submitted (6 Jan 2016) until the final decisions for the Victorian DNSPs are published (26 May 2016), noting that analysis, consultation and decision would have to fit within this period.

In their initial proposals, all of the Victorian distribution service providers proposed to adopt a combination of the RBA and BVAL curves in some form. For the service providers now proposing to include the Thomson Reuters curve in estimates, Figure 3-19 illustrates the timing of proposals and averaging periods compared to the results produced by the curve options.

Figure 3-19 Thomson Reuters compared to the AER's approach



Source: CEG, AER analysis

Note: The vertical line indicates the date on which revised proposals were submitted.

When the revised proposals were submitted, the Thomson Reuters curve had recently diverged from the AER combination to produce materially higher results. At this time, the service providers could have either calculated precisely or had reasonable expectations that including the Reuters curve in addition to or instead of the BVAL and RBA curves would result in higher revenue over their averaging periods. However, from its initial publication (May 2015) until October 2015, and since mid-January 2016, the Reuters curve has tracked very closely with the AER combination.

In contrast, service providers would have had little or no incentive to depart from their initial proposals if the Thomson Reuters curve had generated lower results than the existing combination. As at April 2015, CEG recommended adopting an average of the

RBA and BVAL curves extrapolated using the AER method for the historical period from 2005–06 to 2013–14.[1262]

Overall, we consider that using ex-post assessments of results in the service provider's actual averaging periods is likely to result in upwardly-biased decision making. We are not satisfied that a decision made on this basis would contribute to achievement of the allowed rate of return objective, or that it would appropriately reflect the revenue and pricing principles.

I.1.2 Limited assessment of the Thomson Reuters curve

We have not reached a definitive view on whether use of the Thomson Reuters curve would contribute to an estimate that achieves the allowed rate of return objective. However, based on our analysis, we consider the impact of including or excluding the Thomson Reuters curve appears to be of limited materiality except over a historical period of two months. Our analysis is set out in the following sections:

- comparison of yield curve characteristics
- comparison of outcomes

Comparison of yield curve characteristics

To assist in our assessment of the Thomson Reuters curve, we sought further information from Thomson Reuters,[1263] and from CEG.[1264] Thomson Reuters advised that some data filtering aspects of the bond selection criteria are discretionary and therefore proprietary. However, they indicated that:

- the curve fitting methodology is a 'basis spline' model.
- the bond selection criteria includes the following characteristics:
    - only fixed-rate (ie no floating) senior unsecured bonds
    - no bonds with embedded options
    - Thomson Reuters specifically avoids including bonds issued in other markets because it requires strong assumptions to generate meaningful comparative pricing data.
    - Thomson Reuters removes outliers from the bond universe based on a fairly straightforward standard deviation style filter in comparison to the universe of bonds in term/rating 'buckets'.
    - Table 3-42, below, sets out the comparable characteristics in the three data series. Overall, we note that BVAL and Thomson Reuters have both chosen to exclude bonds with embedded options and bonds issued in other

[1262] CEG, *Critique of the AER's JGN draft decision on the cost of debt*, April 2015, p. 64

[1263] Specifically, AER staff met with Thomson Reuters staff on 18 April 2016;

[1264] CEG, *Response to AER information request*, 8 February 2016.

currencies. This appears to enhance the data quality and comparability of bonds within the sample at the expense of sample size. For the reasons set out in this and previous decisions, we are not persuaded that either the RBA or the BVAL selection criteria are clearly superior. However, the Thomson Reuters bond selection criteria appear to be only incrementally different from the BVAL selection criteria.

Table 3-42 Comparison of known bond selection criteria

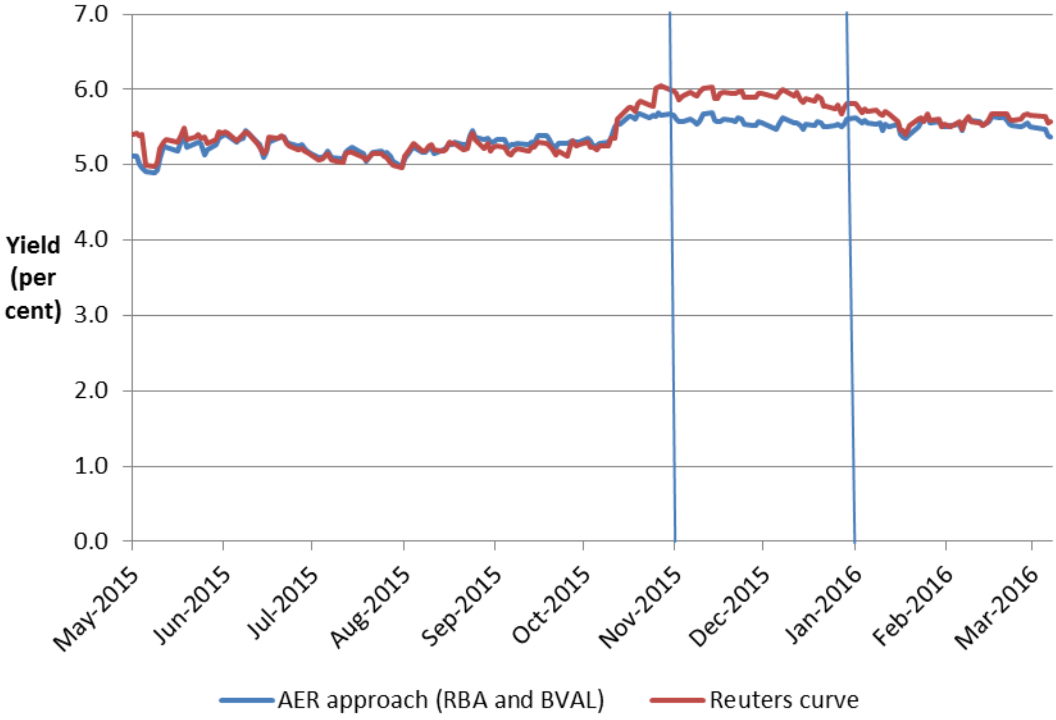
Criteria	RBA	BVAL	Thomson Reuters
Size of issue/quality of pricing data	At least A$100 million (or equivalent) and at least one year remaining term to maturity	BVAL score of 6 or higher , and at least two months remaining term to maturity	Simple outlier-style filter, in addition to other discretionary filtering.
Secured/unsecured	Both secured and unsecured bonds	Unsecured senior bonds only	Unsecured senior bonds only
Embedded options	Includes bonds with embedded options	Excludes bonds with embedded options	Excludes bonds with embedded options
Currency of issue	AUD, EU, USD	AUD only	AUD only

Source: RBA, BVAL, Thomson Reuters.

Comparison of outcomes

Since publication of the 10 year Thomson Reuters yield estimate, it appears to produce results that are comparable to the existing combination, except for a temporary and material divergence over November and December 2015. This is illustrated in Figure 3-20.

Figure 3-20 Comparison of Thomson Reuters 10 year estimate against the AER approach



Source: AER analysis, RBA, Bloomberg, Thompson Reuters.

As at November 2016 the Thomson Reuters curve rose above the existing curves. However, from May 2015 until that time, and since February 2016, it has produced results that are very close to the existing combination. This does not imply these curves will continue to produce similar results. Further, we consider that analysis of the yield curve's underlying characteristics is the most informative means of evaluating the curves.

Nonetheless, CEG has relied on comparative analysis of yields in support of adopting the Thomson Reuters curve.[1265] To the extent that a comparison of outcomes is informative, we are not satisfied that there is sufficient evidence the addition of a third curve would, in expectation, have any more than incremental impact on the outcomes of our current approach. Table 3-43 illustrates that over the full period for which the Thomson Reuters 10 year estimate has been published, the difference between the Thomson Reuters curve and the existing combination is 9 basis points. Excluding the two month divergence within an eleven month sample, the difference is only 2 basis points.

[1265] CEG, *Criteria for assessing fair value curves*, January 2016, p. 9.

Table 3-43 Comparison of Thomson Reuters 10 year estimate against the AER approach

Time period	AER approach (BVAL and RBA)	Reuters curve	Difference
Since Reuters publication	5.39	5.48	9 basis points
Excluding November and December 2015	5.31	5.34	2 basis points
Only November and December 2015	5.57	5.85	27 basis points

Source: AER analysis, RBA, Bloomberg, Thompson Reuters.

I.2 Criticisms of the BVAL curve

Some service providers made updated criticisms of the BVAL curve. Most of these criticisms drew upon new analysis by CEG.[1266] In a new report, and in two memoranda submitted after the revised proposals,[1267] CEG submitted that:

- the Bloomberg curve appears to be influenced at the 10 year term exclusively by the Asciano bond
- There are market specific factors influencing the Asciano bond which imply it is not reflective of the typical BBB bond
- The BVAL curve does not include foreign bonds and is therefore not representative of the benchmark efficient firm given the tendency of Australian firms to issue longer term debt in overseas markets
- The BVAL bond sample is smaller than the RBA bond sample.

We remain satisfied that the BVAL curve is fit-for-purpose and will contribute to an estimate that satisfies the allowed rate of return objective. Further, we are not persuaded that there is evidence suggesting that a simple average of the BVAL and RBA curves would not contribute to an estimate that achieves the allowed rate of return objective. Broadly, we consider that most of the analysis submitted by AusNet Services and CEG supports a conclusion that the BVAL curve and the RBA curve may at points in time produce divergent results. However, this does not indicate that either the RBA curve or the BVAL curve produces an estimate that is more reflective of the benchmark efficient entity.

1266 AusNet Services, *AusNet Services' response to submissions on the Victorian EDPR Preliminary Decision*, February 2016, pp. 18–21.

1267 CEG, *Criteria for assessing fair value curves*, January 2016; CEG, *Memorandum: Recent financial market conditions and the BVAL curve*, February 2016.

In decisions since publication of the guideline, we have concluded that at various points in time, it is likely that one curve or the other is more likely to produce an estimate that is more reflective of the costs faced by the benchmark efficient entity.[1268] However, we have undertaken extensive analysis on the RBA and BVAL curves, have consulted widely on the technical characteristics of curves, and have had regard to independent expert advice. Based on this process, we are not satisfied that either is clearly superior. Further, the approach we adopt must produce annual estimates each year over the five year period that will achieve the allowed rate of return objective. We have therefore adopted an approach that we are satisfied will contribute to estimates that will, across the regulatory period, achieve the allowed rate of return objective. In contrast, we consider that AusNet and CEG's proposal to adopt different approaches based on ad-hoc analysis of the curves over short periods will introduce bias and uncertainty into the approach for estimating the return on debt. We consider this bias will prevent achievement of the allowed rate of return objective.

In addition, even if we were not to adopt the BVAL 10 year estimate, our final decision would be to adopt the BVAL 7 year estimate extrapolated as per the methodology set out in our contingencies. We are not satisfied that any information submitted by stakeholders raises material new concerns with the BVAL's 7 year estimate that were not considered in previous decisions. Therefore, we maintain our conclusion that in the absence of a BVAL 10 year estimate, the 7 year estimate extrapolated to 10 years would contribute to an estimate that achieves the allowed rate of return objective.

Finally, we note that as of October 2015 the RBA made retrospective changes to its yield curve.[1269] These changes resulted in retrospective changes to bond samples as well as changes to yield and spread estimates. AER staff corresponded with RBA staff about the causes and impact of these retrospective changes and remain satisfied that the combination of RBA and BVAL curves will contribute to an estimate which achieves the allowed rate of return objective.[1270] Nonetheless, we note that none of the service providers appear to have engaged in the revised proposals or subsequent submissions with the potential risks and implications of material retrospective changes made to the RBA curve.

In this section, we have addressed the following substantially new issues raised by the service providers and their consultants:

- the comparative movement of the yield estimates between the RBA and BVAL curves
- the incremental impact of the Asciano bond on the implied DRPs in the Bloomberg curve
- CEG's analysis of sample size

[1268] For example: AER, *Final decision—Ausgrid distribution determination—Attachment 3: Rate of return*, April 2015, pp. 202–203; AER, *Preliminary decision—AusNet Services—Attachment 3: Rate of return*, October 2015, p. 224.

[1269] Some information is available on the RBA website: http://www.rba.gov.au/statistics/tables/changes-to-tables.html

[1270] Specifically, AER staff met with RBA staff on 8 April 2016.

- CEG's analysis of foreign bonds

Comparative movement of yield estimates

In its reports and memoranda, CEG has used comparative movements of yield estimates to compare and critique the BVAL curve compared to the RBA and Reuters curves.[1271] We are not satisfied that this type of analysis can robustly demonstrate that either curve clearly better reflects the costs faced by a benchmark efficient entity. More generally, we are not persuaded that time-series or cross-sectional comparisons between curve outputs are reliable or consistent ways to determine which curve produces a result that is most consistent with benchmark efficient costs. This is because the published yield curves are the best available source of information on costs of debt in prevailing market circumstances.

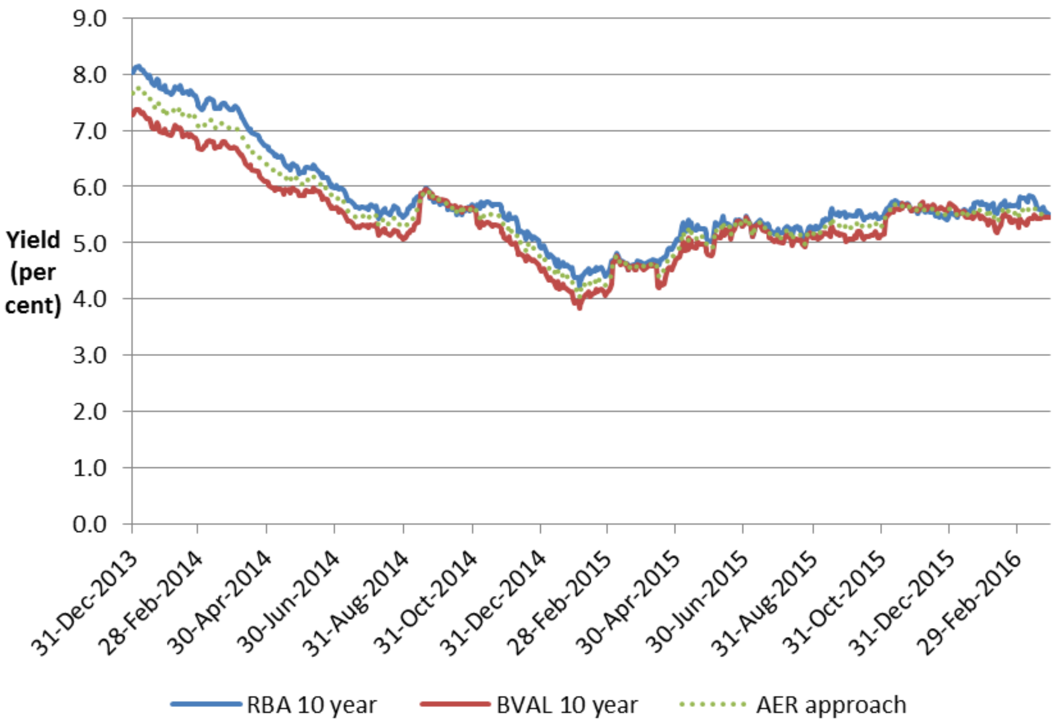
Different market experts may come to different views about the best approaches to estimating yield curves. For example, Bloomberg, the RBA and Thompson Reuters appear all to adopt distinct bond selection criteria and distinct curve fitting methodologies. We have assessed the RBA and BVAL curves through a detailed analysis of their underlying technical characteristics, including analysis from expert consultants.[1272] Our analysis and expert advice supported a conclusion that both curves had strengths and weaknesses, but that neither was clearly superior. Therefore, we do not agree that it is robust or informative to compare the outputs of the two curves against each other.

Nonetheless, to the extent that these comparisons are informative, we are not persuaded that a comparison of the Bloomberg and RBA curves suggest anomalous performance of either curve. Figure 3-21 illustrates the comparative movement of the curves since publication of the AER's guideline. While the curves produce materially different results at specific points in time, they appear to have consistently reflected the same underlying debt market movements

[1271] For example: CEG, *Criteria for assessing fair value curves*, January 2016, p. 9; CEG, *Recent financial market conditions and the BVAL curve – updated to 19 February 2016*, February 2016, p. 1.

[1272] See for example: AER, *Ausgrid distribution determination: Draft Decision—Attachment 3: Rate of return*, pp. 135–150; Lally, *Implementation issues for the cost of debt*, November 2014; ACCC Regulatory Economics Unit, *Return on debt estimation: A review of the alternative third party data series*, August 2014; Lally, *Review of submissions on implementation issues for cost of deb*t, October 2015.

Figure 3-21 Comparison of RBA and BVAL yields



Source: AER analysis, Bloomberg, RBA.

The Asciano bond

CEG and AusNet Services submit that the Asciano bond is having a disproportionate downward impact on the 10 year spread-to-swap estimate implied by the BVAL curve.[1273] Further, they submit that the movement of the Asciano bond is substantially affected by firm specific factors and therefore is not reflective of the benchmark BBB+ bond.[1274] However, this criticism of the BVAL curve relates to the lack of available bonds in the band beyond 7 years' term to maturity. We are not persuaded that this analysis submitted by AusNet Services of CEG raises material new issues that have not been considered previously in reaching the AER's approach prior to Bloomberg's publication of a 10 year BVAL estimate.

In summary of its analysis, CEG submits that the BVAL bond selection criteria 'results in a sample containing only a single bond'.[1275] As noted in recent decisions,[1276] this is not a correct characterisation of Bloomberg's approach. In a recent report, CEG

1273 CEG, *Memorandum: Recent financial market conditions and the BVAL curve*, February 2016, p. 4; AusNet Services, *Response to submissions on AER's EDPR preliminary decision*, February 2016, p. 21.

1274 CEG, *Memorandum: Recent financial market conditions and the BVAL curve*, February 2016, p. 4; AusNet Services, *Response to submissions on AER's EDPR preliminary decision*, February 2016, p. 21.

1275 CEG, *Memorandum: Recent financial market conditions and the BVAL curve*, February 2016, p. 4.

1276 AER, *Preliminary decision—AusNet Services—Attachment 3: Rate of return*, October 2015, p. 242.

submitted that the Bloomberg estimate from beyond 7 years was exclusively informed by the CGS curve.[1277] In response, we corresponded with Bloomberg who confirmed that the yield estimate at 10 years is influenced by all of the constituent bonds within the curve, even where there are few or no constituent bonds within the 7 to 10 year band.[1278] This means that the entire bond sample within the BVAL curve is used to derive the 10 year estimate, not a single bond as CEG has submitted. While bonds closer to the 10 year term may exert a relatively greater influence on the yield estimate at points around that term, CEG's characterisation does not accurately reflect the operation of the curve.

Overall, we conclude that there appears to be a correlative relationship between the Asciano bond and the BVAL 10 year estimate. However, we are not persuaded that there is clear evidence to suggest that the 10 year BVAL estimate is not fit for purpose. In particular, we are satisfied that the 10 year BVAL spread-to-swap estimate appears to be broadly consistent with other bonds that meet the BVAL curve's bond selection criteria. In contrast, over 2016 the spread-to-swap for the 10 year RBA estimate has been below the spreads to swap at its published 3, 5 and 7 year terms.

We have assessed these new submissions in two sections:

- how sensitive the 10 year BVAL estimate is to the Asciano bond
- what impact this is exerting on BVAL curve estimates

Sensitivity of the BVAL estimate to the Asciano bond

In its report submitted with the revised proposals, CEG highlighted the similar movements between the Asciano 10 year bond yield and the BVAL 10 year yield estimate.[1279] We agree that there appears to be correlation between these two yields. However, we are not persuaded that this indicates that the BVAL curve estimate is not representative of its sample more broadly. We would expect that the underlying swap curve is a key driver of yields both for individual bonds and for the BVAL 10 year estimate. Therefore, holding other things constant, it is unsurprising that there would be evidence of correlation, especially where the bond was representative of the rest of the sample underlying the yield curve. We discuss this issue in greater detail in subsequent sections.

More recently, CEG submitted regression analysis to establish a causative relationship between the 10 year Asciano spread to swap.[1280] As CEG's regression analysis was submitted for the first time in a late submission,[1281] we have had limited time to assess the new analysis in detail. However, CEG has not included a variable for an underlying

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1277 For example: CEG, *The hybrid method for the transition to the trailing average rate of return on debt—Assessment and calculations for AGN*, June 2015, p. 75.

1278 AER, *Email correspondence with Bloomberg*, 12 September 2015.

1279 CEG, *Criteria for assessing fair value curves*, January 2016, pp. 5–6.

1280 CEG, *Recent financial market conditions and the BVAL curve – updated to 19 February 2016*, February 2016.

1281 AusNet Services, *Actual Debt Averaging Period – Additional Evidence*, March 2016.

base rate component (either the swap curve or CEG) in its regressions. This is important, because the swap curve is a key driver of pricing:

- Since the Asciano bond was issued, there is a strong negative correlation between the swap curve matching the Asciano bond's term to maturity and the spread-to-swap on the Asciano bond.[1282] This suggests that, for the Asciano bond, the swap curve may be an important driver of the spread-to-swap on the Asciano bond. In turn, this might suggest that the base rate and not the spread-to-swap on the Asciano bond is a key determinant of the BVAL 10 year spread-to-swap.
- Similarly, we mirrored CEG's approach and regressed the BVAL 10 year spread-to-swap against the swap rate. This regression produced a higher R^2 value (0.95) than CEG's regression (0.93). This might indicate a degree of multicollinearity within the regression, which would in turn suggest that CEG's results should be interpreted cautiously.

CEG also does not appear to have tested:

- the impact of any variable for the base rate, either a risk free rate (CGS) or a swap rate (ADSWAP)
- whether spreads to swap within either the RBA or BVAL samples are substantially influenced by movements in the risk free rate or swap curve
- the consequences of these issues for the explanatory power of its submission.

In addition, CEG has not explained methodological choices and assumptions in its regression. For example, CEG has:

- combined spreads to swaps for individual bonds into weekly averages prior to undertaking regressions—it is unclear how this improves the efficacy of the regression, but it does appear to reduce the number of observations and mask potential variation in these underlying data points
- averaged all bond data within term-to-maturity bands—again, it is unclear how this improves the efficacy of the regression, but it does appear to reduce the number of observations and mask potential variation in these underlying data points.

Overall, we are not satisfied that CEG's regression analysis persuasively indicates that the 10 year BVAL estimate is not fit for purpose. Further, this analysis was submitted allowing very little time for assessment, and CEG has undertaken minimal testing and explanation of its methodological choices.

Impact of the Asciano bond on the BVAL estimate

If the 10 year spread-to-swap estimate is disproportionately and downwardly impacted by an influential and unrepresentative bond, we would expect to see this reflected in the margin between 7 and 10 year spread-to-swap estimates. Specifically, in these

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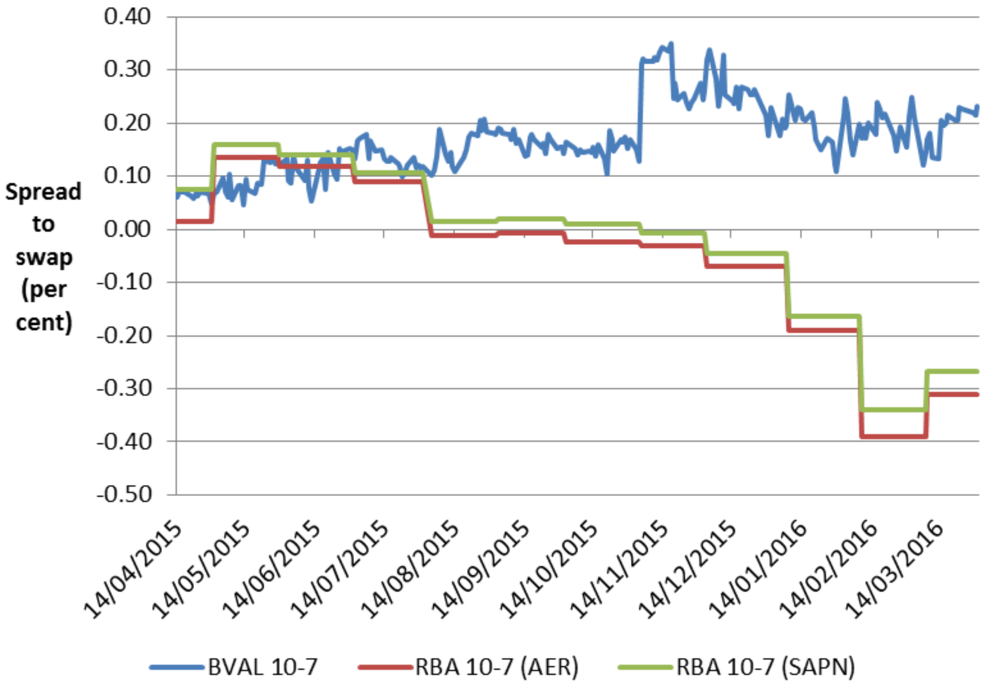
[1282] The correlation coefficient was –0.65.

circumstances we would expect to see a relatively smaller margin between the 7 and 10 year spread-to-swap estimates compared to the RBA curve, which CEG submits is not affected by this disproportionate impact.[1283]

Figure 3-22 Comparison of 7 to 10 year spreads to swap between the published 10 year Bloomberg estimate and the extrapolated RBA estimates



Note: In this chart, we have charted the published RBA figures, rather than the interpolated figures. This is because, in comparing the performance of the underlying curves, we consider it is appropriate to do so with the fewest possible manipulations to its published form. This allows us to differentiate between spread movements caused by the inherent characteristics of the published curve, as opposed to further adjustments made in the regulatory process. When calculating the return on debt for specific averaging periods, we are required to interpolate between these month end estimates.

As set out in Figure 3-22, the DRP margin between the BVAL 10 and 7 year estimates has been similar to or higher than the same margin for the RBA curve since August 2015. This may reflect a range of different factors in underlying bond market conditions at the seven year term or at shorter terms. However, we are not persuaded that there is evidence the Bloomberg 10 year spread-to-swap is artificially depressed compared to peer bonds that meet Bloomberg's bond selection criteria.

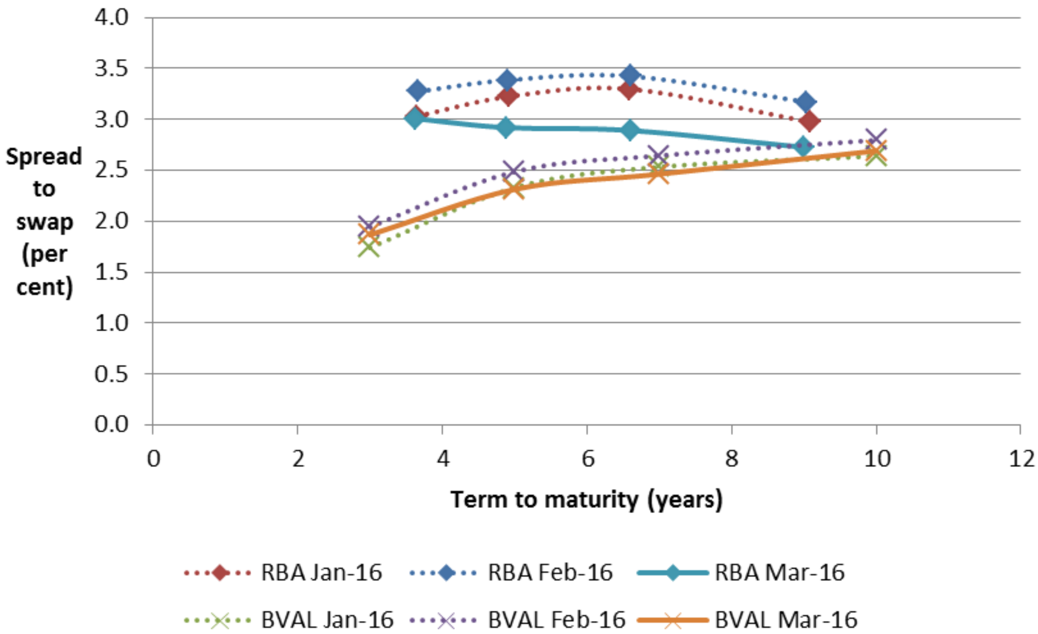
Representativeness of the Asciano bond

[1283] CEG, *Memorandum: Recent financial market conditions and the BVAL curve*, February 2016, p. 5.

In CEG's analysis, it compares the movement of the Asciano curve over January 2015 to bonds issued exclusively in Europe or the United States.[1284] Its analysis suggests that the Asciano bond has performed differently to the comparator bonds and that this indicates it is not representative of the benchmark entity. However, it is unsurprising that different market circumstances would divergently affect bonds issued in different markets.

To illustrate this, Figure 3-23 sets out the spreads to swap for the published RBA and BVAL estimates over January 2016 to March 2016.

Figure 3-23 Spread-to-swap profile for published curves in 2016



Source: AER analysis, RBA

The different shapes of these spreads to swaps across the entire term spectrum suggest that significant factors other rather than simply the Asciano bond are influencing the different spreads to swap between the two curves. It is not clear which shape is more accurately reflecting debt market conditions, however:

- the BVAL spread-to-swap curve reflects a more 'typical' upward sloping yield curve
- the RBA curve in 2016 has consistently exhibited a higher spread-to-swap at the 3 year published estimate compared to the 10 year published estimate.

[1284] We confirmed this by entering the bond tickers from CEG's 'Figure 3: Percentage change in spread-to-swap—31 December to 27 January 2016' into the Bloomberg terminal. See: CEG, *Memorandum: Recent financial market conditions and the BVAL curve*, February 2016, p. 4.

Specifically, in its most recent report,[1285] CEG cited a prior report in which it submitted the following argument for not recommending sole use of Bloomberg's prior curve (the BFVC) during the GFC:

> It would give rise to estimates that are inconsistent with standard predictions of finance theory in that it would impose a downward sloping term structure for credit spreads (and inconsistent with a clear upward slope where there is available data);

CEG has not indicated in its recent reports that it considers this reason is no longer valid, and has directly cited this passage of text in its most recent report. However, this observation would appear equally to suggest that the RBA curve in current circumstances gives rise to estimates which are 'inconsistent with the standard predictions of finance theory'. In contrast, the BVAL curve has remained consistently upward sloping, and by this standard would appear to be more consistent with CEG's interpretation of finance theory. CEG has not addressed this issue in its report or in its 2016 memoranda, nor explained why it remains unconcerned at the consistent downward sloping observations observed in the RBA curve. In addition, we note that we do not agree that an inverted yield curve appears to be 'inconsistent with finance theory'.

AusNet Services submitted further qualitative analysis of why it considers the Asciano bond would artificially depress the BVAL estimates.[1286] Overall, we consider AusNet's analysis draws unsubstantiated qualitative conclusions about an empirical question of relative valuation. AusNet Services argues that the impact of the takeover bid for Asciano:

- would necessarily have led to a downward impact on the yield of the Asciano bond
- would have swamped other market impacts on the spread-to-swap of the Asciano bond, such that it was unrepresentative of its sample group.

However, we are not satisfied that there is persuasive evidence in support of these arguments. The analysis submitted by CEG and AusNet services may support a conclusion that the movements in the Asciano bond are not representative in the movements of bonds issued in European and American bond markets. However, yields on both the Reuters and BVAL curves have trended downwards since November 2015, where the RBA curve has trended upwards.[1287] As set out in our previous decisions, the BVAL bond criteria includes only AUD denominated bonds.[1288] The Reuters criteria similarly allow only AUD denominated bonds.[1289] In contrast, the RBA curve includes

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[1285] CEG, *Criteria for assessing fair value curves, January 2016*, p. 41.

[1286] AusNet Services, *Actual Debt Averaging Period – Additional Evidence*, March 2016, pp. 12–13.

[1287] See for example: CEG, *Recent financial market conditions and the BVAL curve – updated to 19 February 2016*, February 2016, p. 1.

[1288] AER, *Preliminary decision—AusNet Services—Attachment 3: Rate of return*, October 2015, pp. 226–227.

[1289] See section I.1.

AUD denominated bonds, but the majority of bonds within the RBA curve are USD or EU denominated.[1290]

Further, even to the extent there is a transient downward bias, it is not clear that this would result in a worse estimate of the costs faced by a benchmark efficient entity. We consider that our implementation of the return on debt estimate includes several conservative features:

- While we have adopted a 10 year benchmark term, this was based on a weighted average term to maturity of 8.7 years.[1291] We have extrapolated both the RBA and Bloomberg curves for consistency with our benchmark. However, this arguably introduces an upward bias into our estimate in more common circumstances where the yield curve is upward sloping.
- While we have adopted an industry benchmark credit rating of BBB+, both the BVAL and RBA curves include BBB+, BBB and BBB– rated bonds.

Finally, even if we were not to adopt the BVAL 10 year estimate, our final decision would be to adopt the BVAL 7 year estimate extrapolated as per the methodology set out in our contingencies. We are not satisfied that any information submitted by stakeholders raises material new concerns with the BVAL's 7 year estimate that were not considered in previous decisions. Therefore, we remain satisfied that the reasons underlying our choice of approach, as upheld by the Tribunal, remain valid.[1292] To the extent that there are shortcomings in the BVAL curve beyond its 7 year published estimate, we are not persuaded it is appropriate to discard the BVAL curve altogether. We consider it would remain an important and robust source of information, and would adopt the approach that we used in decisions prior to Bloomberg's publication of a 10 year estimate.

Over AusNet Services' averaging period, the average 7–10 year extrapolation margins are as set out in Table 3-44, below.

Table 3-44 Extrapolation margins—Final decision approach compared to the contingency approach

Approach	BVAL extrapolation formula	BVAL extrapolation margin
Final decision approach	Uses published BVAL 10 year yield estimate	+39 basis points
Contingency approach— where BVAL 10 year published estimate is unavailable	BVAL 10 year yield = BVAL published 7 year yield + RBA 10 year yield – RBA 7 year yield	–16 basis points

Source: AER, RBA, Bloomberg.

[1290] AER, *Preliminary decision—AusNet Services—Attachment 3: Rate of return*, October 2015, pp. 226–227.

[1291] AER, *Better Regulation: Explanatory statement—Rate of return guideline*, December 2013, p. 136.

[1292] Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, February 2016, para. 983.

Therefore, if we were to agree with CEG and AusNet Services' criticisms of the published BVAL 10 year estimate, our next preferred approach would result in a reduction to the BVAL estimate of 55 basis points. We note that this extrapolation approach was upheld by the Tribunal after being appealed by Ausgrid, Endeavour Energy, Essential Energy and Jemena Gas Network and that no party sought to challenge those findings on appeal.[1293]

CEG's analysis of sample size

In its reports, CEG has criticised the relatively smaller sample size arising from the BVAL selection criteria compared to the RBA selection criteria.[1294] We agree that a large sample size is clearly preferable to a smaller sample where it is clear that the data is of as good or better quality. However:

- where it is not clear that the data is of as good or better quality, it is a complex exercise to determine whether the benefits of a larger sample outweigh the disadvantages of lower quality data
- a smaller sample does not imply that a curve is not fit for purpose. A larger sample of high quality data is an advantageous feature of a curve, however it needs to be considered in the context of all of the curve's other features and criteria.

Importantly, the size of the bond sample underlying a particular curve is an outcome of the bond selection criteria. Both Lally and the ACCC Regulatory Economics unit assessed the bond selection criteria and advised that while the two sets of criteria were different, neither was clearly superior.[1295] While we agree that individual estimates RBA curve is based on a larger data sample, we are not persuaded that the relatively smaller BVAL sample will not contribute to an estimate which achieves the allowed rate of return objective.

In addition, we consider CEG has not fully addressed the impact of sample size on the estimates. Where the RBA curve may include more bonds in each individual observation, the RBA only publishes estimates for one day in each month. As a consequence, we need to interpolate between month-end estimates in order to have a daily yield series. The impact of this is that, where we adopt the RBA estimate, we only have 12 data points for the spread to CGS that are used to produce a full year of estimates. In contrast, the BVAL curve is published daily, which means that we have approximately 20 times as many data points for estimating the spread-to-swap over the course of a month compared to the RBA curve.[1296]

[1293] Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, February 2016, para. 983.

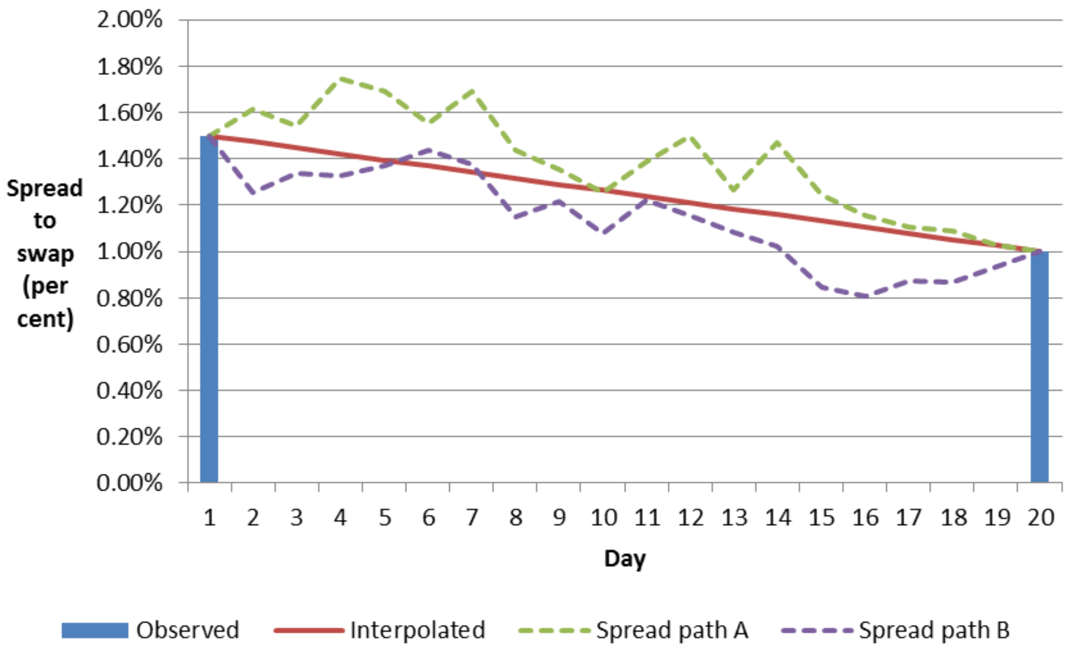
[1294] For example: CEG, *Criteria for assessing fair value curves*, January 2016, p. 31.

[1295] Lally, *Implementation issues for the cost of debt*, November 2014; ACCC Regulatory Economics Unit, *Return on debt estimation: A review of the alternative third party data series*, August 2014; Lally, *Review of submissions on implementation issues for cost of deb*t, October 2015.

[1296] To illustrate this, Bloomberg published data on 252 days in 2015, where the RBA published data on 12 days.

We are broadly satisfied that linear interpolation is reasonable and is unlikely to be biased. However, service providers can and have adopted averaging periods as short as 10 business days within a month. It is plausible that linear interpolation for these short averaging periods results in an underestimate or overestimate of the daily spreads to swap.

Figure 3-24 Illustration of monthly publication on sample size and error



In addition, the RBA's publication of data on one day a month masks any underlying daily volatility in its estimates.

In its February 2016 submission, AusNet Services criticised the BVAL curve on the basis that '[h]owever, despite the high level of volatility in financial markets, the spread implied by the BVAL 10 year curve has remained flat between December 2015 and January 2016.'[1297] We do not agree that AusNet Services' submission should inform conclusions about the underlying performance of the curve. Its conclusion depends on a qualitative comparison of the movements in a yield curve that is published by an independent third party market expert against AusNet Services' own expectations of how yields should have reacted. However, it is not reliably possible to assess the underlying volatility in the RBA curve due to its publication of substantially fewer estimates. We therefore are not satisfied that this is a reasonable basis on which to reach a conclusion about which of the RBA or BVAL curves is more likely to result in an estimate which contributes to achievement of the allowed rate of return objective.

[1297] AusNet Services, *AusNet Services' response to submissions on the Victorian EDPR Preliminary Decision*, February 2016, pp. 20–21.

CEG's analysis of foreign bonds

We are not persuaded that CEG's analysis of foreign bond issuance demonstrates that a combination of the RBA and BVAL curves will not contribute to an estimate which achieves the allowed rate of return objective. CEG has made two distinct arguments relating to foreign bond issuance:

- CEG submits that Australian companies have tended to issue long term debt in foreign debt markets
- CEG has argued that the Asciano bond is behaving in a way unrepresentative of the benchmark entity with exclusive reference to price movements of foreign bonds.

CEG has also submitted analysis suggesting that the RBA curve better reflects the benchmark efficient entity's debt raising practices because Australian companies with long term debt currently on issue have typically done so in overseas markets.[1298] CEG submits that there are two primary reasons for Australian firms commonly issuing foreign currency debt, being:[1299]

> - First, the demand for long dated corporate debt is deepest in foreign currency markets, which means that this will often be the least expensive market in which to issue long dated debt. This is consistent with the data that suggests that the use of foreign currency debt is higher for longer dated debt.
> - Second, there are benefits from diversifying funding sources and maintaining a presence (relationship with funders) in a number of markets so that these markets can be used in future as needed

However, in recommending a choice of data series over this period, CEG has recommended adopting the Bloomberg and RBA estimates extrapolated using the AER approach. For example, in an April 2015 report submitted by AusNet Services, CEG concluded that:[1300]

> Our best estimate of the 9 year trailing average DRP is 2.41%, which sits in the middle of the single lowest and highest values. Our best estimate is derived by giving equal weight to the Bloomberg and RBA curves, and using the AER draft decision extrapolation methodology for the years 2005/06 to 2013/14.

For the reasons set out in this and previous decisions, we are not persuaded by the approach CEG has adopted for testing which curve or combination of curves should apply. Nonetheless, its own analysis appears to indicate that a simple average of the Bloomberg and RBA curves is representative of the costs faced by a benchmark efficient entity over the preceding 9 years. Therefore, regardless of whether Australian bond issuance is predominantly domestic or foreign, CEG's analysis appears to

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[1298] CEG, *Criteria for assessing fair value curves, January 2016*, pp. 2–3.

[1299] CEG, *Criteria for assessing fair value curves, January 2016*, p. 20.

[1300] CEG, *Critique of the AER's JGN draft decision on the cost of debt*, April 2015, p. 64

suggest that a combination of the BVAL and RBA curves has been reflective of those costs over multiple regulatory periods.

Further, to the extent that foreign debt issuance becomes materially more expensive than domestic debt issuance, we would expect that a benchmark efficient entity might seek to issue a greater proportion of its new debt domestically, and/or at shorter terms. We are satisfied that this is an available and viable strategy. It also appears to be consistent with CEG's submission that longer term foreign debt issuance is attractive because it is relatively less expensive.[1301] Specifically, CEG's analysis suggests that service providers will seek debt raising strategies at least in part where they are less costly.

As identified by Chairmont, service providers have a number of options for efficiently departing from the strict benchmark characteristics, including amongst other strategies:

- issuing shorter term debt or longer term debt than the 10 year benchmark
- issuing 'lumpy' debt where market conditions are favourable and reducing debt issuance where they are unfavourable.[1302]

These options appear to be consistent with the actual practices of the service providers. For example, during the Guideline, the ENA provided debt issuance information for eleven privately owned service providers.[1303] This evidence supported a conclusion that service providers raised debt using:

- bank debt and commercial paper which have issuance tenors of between 1 month and 7.0 years
- Australian bonds which have issuance tenors of between 2.7 and 21.3 years
- offshore bonds which have tenors of between 4 and 30 years.[1304]

Figure 3-25, below, charts the range of term issuances. This illustrates that while many bond issuances are at 10 years or more, service providers commonly raise debt at shorter terms as part of their portfolio. Further, with respect to bond issuance since 2009, a greater proportion of borrowing appears to have been done at terms less than 10 years.

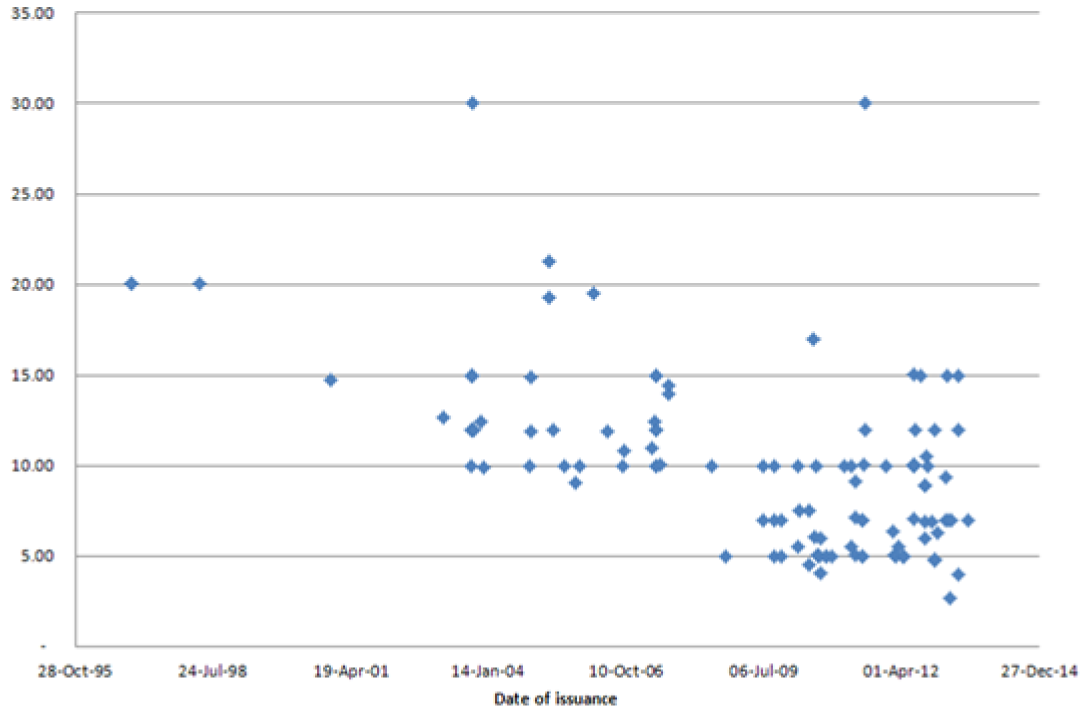
[1301] CEG, *Criteria for assessing fair value curves, January 2016*, p. 20.

[1302] Chairmont, *Financing practices under regulation*, October 2015, pp. 24–26.

[1303] ENA, *Submission to the draft guideline*, October 2013.

[1304] AER, *Better Regulation: Explanatory statement—Rate of return guideline*, December 2013, December 2013, p. 143.

Figure 3-25 Service providers' terms at issuance of bonds (as at 30 June-20 September 2013 years)



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Source: ENA provided eleven business debt portfolios, AER analysis.

Note: Two businesses provided portfolio information as at 30 June 2013, eight as at 30 August 2013 and one as at 20 September 2013.

Therefore, while there may be divergent conditions between domestic and foreign bond markets at a point in time, we are not persuaded that a simple average of the BVAL and RBA curves will not result in an estimate that reflects the costs faced by a benchmark efficient entity. To the extent that domestic debt as captured in the BVAL curve appears to be relatively less costly than overseas debt, we are satisfied that service providers are able to respond to these changing conditions. We remain satisfied that a simple average of the BVAL and RBA curves will contribute to an estimate that achieves the allowed rate of return objective.

I.3 Other issues

This section sets out our analysis of other issues raised by CEG. Specifically, we address:

- CEG's new criteria for selecting bonds and their impact on weighting
- Analysis of the mean squared error (MSE) for determining weighting

Weighting and criteria

In the event that we were to consider inclusion of additional curves in future, we are not persuaded by the methodology adopted by CEG to justify a recommendation of either 100% reliance on the RBA curve, or of unequal weighting between curves.[1305] This particular weighting appears arbitrary and is based on qualitative criteria set out by CEG which do not appear to improve on or replace the set of principles that were set out in the Guideline and consulted on more widely.[1306] As noted recently by the Tribunal in relation to the choice of data sets adopted in our guideline:

> The AER had a choice to make as to what data services, or combination of data services, it should use. Its reasons for selecting the combination of data services are cogent, and reasonable. It is not shown to have misunderstood or overlooked material information. Although there are facts underlying the choice of the AER, the Tribunal is not persuaded of any particular material factual finding which is different from those made by the AER. For the purposes of the relevant Final Decisions, the AER does not positively find that the RBA curve was clearly superior to the BVAL curve, so that its averaging of the two curves was an acceptable measure of the DRP.[1307]

We remain satisfied that our criteria developed and applied in the Guideline and subsequent decisions remain fit for purpose. Further, we are satisfied that application of these criteria will contribute to estimates that will achieve the allowed rate of return objective.

Mean squared error

We are not persuaded by CEG's analysis of the MSE. In determining the weighting that we would adopt for the average of the BVAL and RBA curves, we have relied on advice from Lally.[1308] Specifically, Lally concluded that a simple average of the BVAL and RBA curves would be likely to minimise the mean squared error (MSE) of the estimator.[1309] CEG disagrees with Lally's analysis of the mean squared error (MSE) of the curve combination, which contributed to our adoption of a simple average between the Bloomberg and RBA curves.[1310] In particular, CEG submits that that the MSE should be evaluated every year, rather than over time,[1311] and that the Bloomberg curve is downwardly biased.[1312]

1305 CEG, *Criteria for assessing fair value curves, January 2016*, p. 55.

1306 AER, *Better Regulation: Explanatory statement—Rate of return guideline*, December 2013, pp. 23–24; AER, *Preliminary decision— Ausgrid —Attachment 3—Rate of return*, April 2015, p. 197pp. 320–322 ; CEG, *Criteria for assessing fair value curves*, January 2016, p. 17.

1307 Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, February 2016, para. 983.

1308 See for example: AER, *Preliminary decision—AusNet Services*, October 2015, p. 224.

1309 Lally, *Implementation issues for the cost of debt*, 20 November 2014, p. 5.

1310 CEG, *Criteria for assessing fair value curves*, January 2016, pp. 59–61.

1311 CEG, *Criteria for assessing fair value curves*, January 2016, p. 60.

1312 CEG, *Criteria for assessing fair value curves*, January 2016, pp. 61.

If the Bloomberg curve were systematically biased, this might indicate that a simple average would not minimise the MSE of the estimator. However, at any point in time it is likely that one curve or the other will produce an estimate that is a better reflection of the costs faced by a benchmark efficient entity. We do not agree that there is a reliable or practical method to quantitatively identify which of the two curves better reflects these benchmark efficient costs at any point in time.[1313] For this reason, we are not persuaded by CEG's recommendation that MSE should or even can be robustly evaluated for each individual estimate. In contrast, we are satisfied that there is no clear reason to expect systematic or nonzero bias in either curve. Nonetheless, the rules require that we determine an approach which can be given effect through automatic application of a formula. This requires that any approach we determine be robust and fit for purpose not just at the time of the final decision. The approach must also be likely to remain robust and fit for purpose for the subsequent five years. We are therefore satisfied that Lally's analysis of the MSE of the estimator is reasonable.

Further, we are not satisfied that CEG has substantiated the existence of downward bias within the BVAL curve. In contrast, we consider:

- CEG has not substantiated evidence of bias in the Bloomberg curve between 7 and 10 years. As discussed in section I.2 and in previous decisions, its description of Bloomberg's methodology is inconsistent with the description confirmed by Bloomberg staff.
- For the period 2005–2014, CEG has recommended adopting a simple average of the RBA and Bloomberg curves extrapolated using the AER approach.[1314] This appears to suggest that CEG has not observed material downward bias in the BVAL curve over the period for which the curve data is available.
- Further, as illustrated in Figure 3-22, the 7 to 10 year margin of the BVAL DRP relative to CGS is both positive and higher than the same margin implied by the RBA curve. Therefore, we are not persuaded that there is evidence of downward bias in the BVAL curve's estimation beyond 7 years.

For these reasons, we remain satisfied that a simple average of the RBA and BVAL curves is likely to minimise the MSE of the estimate over time.

I.4 Averaging periods

We set out our decision on JEN's revised proposed debt averaging periods for 2016 to 2020 in section 3.4.2. This section responds to the issues raised in service providers' proposals and revised proposals, and submissions from other stakeholders.

1313 We discuss this in section 0 and in previous decisions. For example, AER, *Preliminary decision— Ausgrid — Attachment 3—Rate of return*, April 2015, pp. 230–236.

1314 For example: CEG, *Critique of the AER's JGN draft decision on the cost of debt*, April 2015, p. 64.

I.4.1 Response to key issues raised by stakeholders

In our current regulatory processes, different service providers have proposed different methods for setting debt averaging periods during the regulatory control or access arrangement period (regulatory period). Many service providers have proposed more complicated approaches to nominating debt averaging periods in order to achieve greater flexibility. This is common to other aspects of the return on debt, such as the choice of third party data series. Table 3-45 summarises the different approaches to the nomination of debt averaging periods proposed by different service providers.

Table 3-45 Summary of service providers' averaging period proposals

Service Provider	Number of averaging periods nominated in revised proposal	Annual process for nominating averaging periods	Lag of one year in the annual update process	Separate averaging periods for DRP and base rate	Not as close as practically possible to start of each regulatory year
AusNet Services	All				X
United Energy	All				
JEN	First year only	X	X		X
CitiPower / Powercor	All				
ActewAGL	First year only	X	X		X
AGN	All			X	
Amadeus	All				

Source: AER analysis; AusNet, *Revised regulatory proposal*, 6 January 2016, p. 7-36; United Energy, *United Energy's revised regulatory proposal—nominated debt averaging periods (Confidential)*, 6 January 2016; United Energy, *Revised regulatory proposal*, 6 January 2016, p. 75; JEN, *Revised regulatory proposal—Attachment 6-1: Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 36–37; CitiPower, *Revised regulatory proposal*, 6 January 2016, p. 349; Powercor, *Revised regulatory proposal*, 6 January 2016, p. 343; ActewAGL, *Revised access arrangement proposal: Appendix 5.01—Detailed response to rate of return, gamma and inflation*, January 2016, pp. 46–47; AGN, *Revised access arrangement proposal—Attachment 10.26 Response to draft decision: Rate of return*, 6 January 2016, pp. 41–42; AGN, *Revised access arrangement proposal—Attachment 10.2A Response to draft decision: Averaging periods (Confidential)*, 6 January 2016; Amadeus, *Revised access arrangement proposal—Attachment E: Averaging periods (Confidential)*, 6 January 2016.

Our decision is that the service providers' averaging periods:

- should be nominated before the regulatory period commences
- should not be separated into DRP and base rate averaging periods
- are not required to be as close as practically possible to the start of the each regulatory year, but should fall within a particular timeframe.

Each of these is discussed in more detail below.

We have also received submissions from other stakeholders. For example, the CCP does not support the service providers' proposals to nominate an averaging period for each regulatory year just prior to that regulatory year, rather than at the start of the whole regulatory period. It considers this increases the complexity and opportunities for regulatory gaming.[1315]

Annual process for nominating debt averaging periods

United Energy, Jemena Electricity Networks (JEN), CitiPower, Powercor and ActewAGL initially proposed to depart from the Guideline in relation to nominating all averaging periods before the start of the regulatory period (the 'Guideline condition'). Instead, these service providers proposed to nominate their averaging periods in a separate process each year.[1316] JEN and ActewAGL maintained this approach in their revised proposals.[1317] However, CitiPower, Powercor and United Energy did not press this approach in their revised proposals.[1318]

The service providers, in their initial proposals, submitted or implied the Guideline condition might be inconsistent with the ARORO.[1319] Their reasoning for an annual process to nominate debt averaging periods appears to centre on a view that this approach:[1320]

- reduces the risk of mismatch between the efficient financing costs of a benchmark efficient entity and the allowed return on debt[1321]

1315 CCP3, *Response to proposals from Victorian electricity distribution network service providers for a revenue reset for the 2016–2020 regulatory period: Attachment 1*, August 2015, p. 86.

1316 All these service providers nominated an averaging period for their first regulatory year (except for United Energy, who nominated averaging periods for its first and second regulatory years). They proposed an annual process to nominate averaging periods for the subsequent regulatory years. See: United Energy, *Regulatory proposal—Rate of return on debt attachment*, 30 April 2015, pp. 31–36; JEN, *Regulatory proposal—Attachment 9-2: Rate of return proposal*, 30 April 2015, pp. 101–102; CitiPower, *Regulatory proposal*, 30 April 2015, pp. 235–238; Powercor, *Regulatory proposal*, 30 April 2015, pp. 243–246; ActewAGL, *Access arrangement proposal—Appendix 8.01: Detailed return on debt proposal*, 1 July 2015, pp. 15–17.

1317 JEN, *Revised regulatory proposal—Attachment 6-1: Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 36–37; ActewAGL, *Revised access arrangement proposal: Appendix 5.01—Detailed response to rate of return, gamma and inflation*, January 2016, pp. 46–47.

1318 CitiPower, *Revised regulatory proposal*, 6 January 2016, p. 349; Powercor, *Revised regulatory proposal*, 6 January 2016, p. 343; United Energy, *Revised regulatory proposal*, 6 January 2016, p. 75.

1319 NER, cl. 6.5.2(h) and 6A.6.2(h); NGR, r. 87(8).

1320 The service providers also considered this approach reduces the risk of the confidential averaging periods becoming known to third parties. We are satisfied that our approach to handling confidential material minimises the risk of confidential averaging periods becoming known to third parties. United Energy, *Regulatory proposal—Rate of return on debt attachment*, 30 April 2015, pp. 31–36; JEN, *Regulatory proposal—Attachment 9-2: Rate of return proposal*, 30 April 2015, pp. 101–102; CitiPower, *Regulatory proposal*, 30 April 2015, pp. 235–238; Powercor, *Regulatory proposal*, 30 April 2015, pp. 243–246; ActewAGL, *Access arrangement proposal—Appendix 8.01: Detailed return on debt proposal*, 1 July 2015, pp. 15–17.

1321 NER, cl. 6.5.2(k)(1) and 6A.6.2(k)(1); NGR, r. 87(11)(1).

- is consistent with the rule requirement for the change in revenue from the annual debt update to result from the automatic application of a formula that is specified in the determination.[1322]

ActewAGL and JEN maintained these views in their revised proposals.[1323]

As we stated in our preliminary decisions, we do not agree with the service providers' submissions. Our decision is that the service providers' averaging periods should be nominated before the regulatory period commences. This is consistent with our preliminary decision. We consider the Guideline condition is consistent with a return on debt averaging period that satisfies the rules. This contributes to the achievement of the ARORO.[1324] We also consider the service providers have overstated the risk associated with nominating averaging periods in advance of the regulatory period commencing. We set out our reasons for these positions in the following paragraphs.

We consider the Guideline condition to nominate averaging periods upfront during the distribution determination process is consistent with a return on debt that contributes to the achievement of the ARORO and other rule requirements because it:

- provides an appropriate balance between flexibility and certainty that facilitates service providers to organise their financing arrangements in a way that promotes efficient financing decisions and enables them to manage risk
- results in an unbiased outcome because it requires service providers to nominate their averaging periods in advance[1325]—this allows us to provide ex-ante compensation for a benchmark efficient entity's efficient financing costs (all else being equal) (see sections 3.3.3 and H.2)
- facilitates the achievement of the rules requirement that changes to revenue resulting from the annual debt update occur through the 'automatic' application of a formula specified in the distribution determination.

We provide service providers with flexibility to nominate the length of their averaging periods, which can be anywhere between 10 business days and 12 months. We also provide service providers with the flexibility to nominate the same or different averaging periods for different years in a regulatory period.

We also provide service providers with the certainty that no matter how interest rates change, we will compensate service providers for the prevailing return on debt during that averaging period by reflecting those interest rates in their revenue allowance. We consider this certainty would provide service providers with confidence to organise

[1322] NER, cl. 6.5.2(l) and 6A.6.2(l); NGR, r. 87(12).

[1323] JEN, *Revised regulatory proposal—Attachment 6-1: Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 36–37; ActewAGL, *Revised access arrangement proposal: Appendix 5.01—Detailed response to rate of return, gamma and inflation*, January 2016, pp. 46–47.

[1324] NER, cl. 6.5.2(h) and 6A.6.2(h); NGR, r. 87(8).

[1325] Lally observed that if a regulated business can select an averaging period by looking at historical yields, it may introduce an upward bias. Lally, *Expert Report of Martin Thomas Lally*, 13 February 2011, pp. 9–10.

their financing around the averaging periods set in the decision. This is consistent with the NEO/NGO and revenue and pricing principles which seek to promote decisions that are in the long term interests of consumers through the promotion of efficient investment and the use of effective incentives and appropriate regard to risks.

We consider a return on debt estimated using an averaging period determined in advance of it occurring can be expected to be unbiased.[1326] If an averaging period is chosen after that period occurs, the knowledge of returns at any past point of time influences the choice, creating an inherent bias. It would not matter if the period were chosen by the AER, the service provider, a user or consumer, the Tribunal or another stakeholder. This view has been recognised by experts and expressed by us in the Guideline.[1327] We consider a biased return on debt estimate would not provide ex-ante compensation for a benchmark efficient entity's efficient financing costs. As such, it would not satisfy the ARORO.

We consider the Guideline condition facilitates a change in revenue from the annual debt update to result from the automatic application of a formula that is specified in the decision. This is consistent with the rules requirement for automatic updating. This is because nominating averaging periods before the regulatory control period or access arrangement period commences simplifies the annual updating process. We consider a sufficiently simple, mechanistic process is required to meet this requirement. It is not clear to us that adding an additional process that requires judgement and assessment is consistent with the rules requirement. We consider it is difficult to account for the many uncertainties inherent in a process that requires judgement and assessment. Our experience is that agreeing on averaging periods is not necessarily a straightforward exercise. This is because service providers have an incentive to dispute averaging periods when it is in their interests to do so. For example:

- The NSW electricity distributors recently advocated using a long term historical averaging period for calculating the risk free rate for the return on equity. As an alternative option, they also proposed using a different short term averaging period to what we have proposed to them. The NSW electricity distributors also advocated using different averaging periods to calculate the return on debt by proposing an immediate transition to the trailing average.[1328]

[1326] In the Federal Court, the reference to 'an unbiased rate of return' was interpolated to involve, 'making a prediction about interest rates which although too high or too low at any particular point in time, is on average correct'. Federal Court of Australia, *ActewAGL Distribution v The Australian Energy Regulator [2011] FCA 639*, 8 June 2011, para 39.

[1327] Similar considerations apply when setting averaging periods in advance for estimating both the return on debt and the risk free rate to inform the return on equity. See AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 79–80; Lally, M., *Expert Report of Martin Thomas Lally*, 13 February 2011, pp. 9-10. See the Federal Court of Australia's observations of the views expressed by Houston and Lally in Federal Court of Australia, *ActewAGL Distribution v The Australian Energy Regulator [2011] FCA 639*, 8 June 2011, para 145.

[1328] Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, pp. 175, 189; Endeavour Energy, *Revised regulatory proposal*, January 2015, pp. 205, 214; Essential Energy, *Revised regulatory proposal*, January 2015, pp. 215, 232.

- We have had decisions taken to the Tribunal and the Federal Court of Australia over the averaging period.[1329]
- The averaging period has been a contentious issue in a number of previous determination processes.[1330]

Further, the addition of an extra process each year to nominate averaging periods would add further complexity and costs to the administration of regulation. We consider:

- The service providers proposal to annually nominate averaging periods could complicate the regulatory process. We are concerned that complicating the regulatory regime further could make the trailing average approach impractical to implement. We note that the trailing average approach originated with the UK regulator, Ofgem. Our understanding of Ofgem's approach is that it does not provide service providers with the flexibility to choose their own averaging periods. Instead, it appears that Ofgem uses a continuous data series to implement the trailing average approach. Accordingly, the service providers' proposed implementation of the trailing average is more complex than our approach and considerably more complex than Ofgem's approach. We are not aware of any economic regulator that adopts a return on debt methodology as complex as what the service providers have proposed.
- This complexity is amplified by potential differences between the annual processes that could be proposed by different service providers. For example, JEN's annual process requires nomination of an averaging period for regulatory year t at least 50 business days before the commencement of regulatory year t–1. However, ActewAGL requires nomination by 30 April of regulatory year t–2.[1331]

We may accept increased complexity where the benefits clearly outweigh the costs. For example, in the Guideline, we adopted annual updating to the return on debt and provided more flexibility over the averaging periods service providers could nominate (up to 12 months). While we recognised this would increase costs associated with complexity and the administration of regulation, we also considered the benefits would outweigh the costs.[1332] In contrast, based on the reasons provided by the service providers in the original and revised proposals, we are not satisfied that there are benefits which outweigh the additional complexity resulting from the service providers' proposals and revised proposals.

[1329] Australian Competition Tribunal, *Application by Energy Australia and Others [2009] ACompT 8*, 12 November 2009; Federal Court of Australia, *ActewAGL Distribution v The Australian Energy Regulator [2011] FCA 639*, 8 June 2011.

[1330] For example see, AER, *distribution determination, Aurora 2012–13 to 2016–17*, pp. 192–209; AER, *SP AusNet final decision part 2: Attachments*, March 2013, p. 75; AER, *SP AusNet final decision part 2: Attachments*, March 2013, p. 114; AER, *Multinet final decision part 2: Attachments*, March 2013, p. 97.

[1331] JEN*, Revised regulatory proposal—Attachment 6-1: Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p. 37; ActewAGL, *Revised access arrangement proposal: Appendix 5.01—Detailed response to rate of return, gamma and inflation*, January 2016, p. 46.

[1332] AER, *Explanatory statement to the rate of return guideline*, 17 December 2013, p. 112.

JEN and ActewAGL considered their approach was not overly complex and reduced risk. They submitted that there is significant uncertainty around future spending and when refinancing will need to occur over the next regulatory period. They submitted that a benchmark efficient entity can better match its cash needs with funding if it can nominate the averaging period closer to when it raises or refinances debt because it can more accurately forecast its liquidity position.[1333] We consider the risks discussed in the service providers' initial and revised proposals have been overstated. We are not satisfied that nominating averaging periods before the regulatory period commences creates significant risk or leads to a return on debt estimate that does not satisfy the ARORO . This is because:

- Our objective in setting the allowed return on debt is to contribute to the achievement of the ARORO. As set out in sections 3.3.3 and H.2, we consider this requires us to set an allowed return on debt that provides ex-ante compensation for a benchmark efficient entity's efficient debt financing costs. We have regard to the desirability of reducing any mismatch between the return on debt allowance and a benchmark efficient entity's actual debt cost outcomes (or cash outflows). However, some mismatch between the actual debt costs and the regulated debt allowance is an intrinsic part of incentive regulation—whether the allowance is set using a trailing average approach or otherwise. The regulatory regime is not meant to remove all risk from service providers. This is why we provide an allowance for systematic risks (including but not limited to interest rate risk) through the allowed return on equity. Our regulatory approach enables service providers to match their cash inflows and outflows better than most businesses in the economy, and this position is supported by Chairmont.[1334] Overall, to the extent there is compensable risk from a mismatch, we consider it is appropriately compensated for ex-ante in our allowed rate of return, which we consider will achieve the ARORO.
- Under the trailing average approach, we reset one tenth of the return on debt each year to reflect prevailing market rates. We consider this, if anything, is likely to reduce risk relative to the on-the-day approach (for a benchmark efficient entity). This is because, relative to the on-the-day approach, the trailing average approach is likely to reduce any mismatch between a benchmark efficient entity's actual debt costs and the allowed return on debt. Therefore, the timing of the averaging period and the timing that a benchmark efficient entity may raise debt is likely to be more closely aligned.
- We allow service providers to nominate annual averaging periods up to a maximum of 12 months in length.[1335] Given this, if service providers chose to, they could

[1333] JEN, *Regulatory proposal—Attachment 9-2: Rate of return proposal*, 30 April 2015, pp. 101–102; ActewAGL, *Access arrangement proposal—Appendix 8.01: Detailed return on debt proposal*, 1 July 2015, pp. 15–17; JEN, *Revised regulatory proposal—Attachment 6-1: Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 36–37; ActewAGL, *Revised access arrangement proposal: Appendix 5.01—Detailed response to rate of return, gamma and inflation*, January 2016, pp. 46–47.

[1334] See Chairmont, *Cost of debt: Transitional analysis*, April 2015.

[1335] AER, *Rate of return guideline*, December 2013, p. 21.

create the situation where they could issue debt whenever they wanted and have this fall inside their nominated averaging period.[1336]

- Most service providers currently under review have nominated averaging periods for all regulatory years in their proposals. We do not consider this is consistent with the other service providers' submissions that nominating averaging periods before the regulatory period commences creates significant risk.

Separate averaging periods for the DRP and base rate

Australian Gas Networks (AGN) proposed, in its initial and revised proposal, separate averaging periods for the base rate and DRP components of the return on debt.[1337] To support its position, it submitted two reports by CEG, one in 2015 with its initial proposal, and one in 2016 with its revised proposal.[1338] AGN was the only service provider to propose this approach.

AGN (and CEG) considered that this reduces the risk of mismatch between the efficient financing costs of a benchmark efficient entity and the allowed return on debt.[1339] AGN (and CEG) submitted that using a longer averaging period for the DRP and a shorter averaging period for the base rate is consistent with an efficient debt management strategy where:

- debt issuance cannot be easily managed to short windows each year
- swap contracts, being more flexible and liquid, can be used to manage base rates of interest to short windows each year.

We did not consider the possibility of separating debt averaging periods in the Guideline. Our decision is that debt averaging periods should not be separated into

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1336 That is, service providers could nominate a long averaging period, and issue debt sometime within that period. Or they could issue debt around the averaging period. We do not consider it is necessary for a benchmark efficient entity to issue or hedge all debt perfectly within the averaging period for it to receive significant risk reduction benefits. For example, in relation to the NSW service providers, we considered that during the global financing crisis, even if a benchmark efficient entity in their circumstances required 90 business days to hedge their debt, and the averaging periods was 15 or 40 businesses days, this would still be efficient and significantly reduce their interest rate risk relative to not hedging at all. This position is supported by expert advice we received from Chairmont and Lally. AER, *Final decision—TransGrid–Transmission determination*, April 2015, Attachment 3; Chairmont, *Cost of debt: Transitional analysis*, April 2015; Lally, *Review of submissions on the cost of debt*, April 2015.

1337 AGN, *Access arrangement proposal—Attachment 10.1: Rate of return*, 1 July 2015, pp. 56–57; AGN, *Revised access arrangement proposal—Attachment 10.26 Response to draft decision: Rate of return*, 6 January 2016, pp. 41–42.

1338 CEG, *The hybrid method for the transition to the trailing average rate of return on debt: Assessment and calculations for AGN*, June 2015, pp. 83–84; CEG, *Curve testing and selecting averaging periods: A report for AGN*, January 2016, pp. 11–14.

1339 AGN, *Access arrangement proposal—Attachment 10.1: Rate of return*, 1 July 2015, pp. 56–57; AGN, *Revised access arrangement proposal—Attachment 10.26 Response to draft decision: Rate of return*, 6 January 2016, pp. 41–42; CEG, *The hybrid method for the transition to the trailing average rate of return on debt: Assessment and calculations for AGN*, June 2015, pp. 83–84; CEG, *Curve testing and selecting averaging periods: A report for AGN*, January 2016, pp. 11–14.

DRP and base rate components, consistent with our draft decision for AGN.[1340] We have considered AGN's revised proposal and CEG's latest report, and maintain our position. We consider:

- As set out under 'Annual process for nominating debt averaging periods' above, our objective in setting the allowed return on debt is to satisfy the ARORO. We do not consider the ARORO requires us to set a return on debt that precisely matches the debt cash outflows from a particular debt financing strategy.[1341] We also do not consider it is possible or desirable to define a benchmark efficient financing strategy to the level of detail in AGN's proposals. Partington and Satchell recommended against interpreting efficient debt financing costs as the debt costs that result from an assumed financing strategy (including particular hedging arrangements). In particular, they consider what constitutes benchmark efficient financing practices is ambiguous and differs across firms depending on their objectives and circumstances.[1342]
- As set out under 'Annual process for nominating debt averaging periods' above, we have regard to the desirability of reducing any mismatch between the return on debt allowance and a benchmark efficient entity's actual debt cost outcomes (or cash outflows).[1343] However, we consider the regulatory regime is not meant to remove all risk from service providers. We also consider our allowed return on debt contributes to the achievement of the ARORO.
- AGN (or CEG) has not demonstrated its proposed approach leads to a materially preferable outcome, particularly given our approach allows it to nominate a single averaging period up to 12 months in length.[1344] We consider if service providers prefer to reduce the volatility in their DRP compensation, they can do so by nominating a single long averaging period.
- AGN's proposed approach adds further complexity and costs to the administration of regulation. We are not satisfied that AGN has identified there are benefits which outweigh the additional complexity resulting from this approach. We maintain this view after consideration of CEG's (and AGN's) submission that AGN's proposal is not complex.[1345] We consider AGN's proposed approach adds unjustified

[1340] See AER, *Draft decision: Australian Gas Networks access arrangement 2016 to 2021: Attachment 3—Rate of return*, November 2015, pp. 609–611.

[1341] AGN, *Revised access arrangement proposal—Attachment 10.26 Response to draft decision: Rate of return*, 6 January 2016, p. 42; CEG, *Curve testing and selecting averaging periods: A report for AGN*, January 2016, pp. 12–14.

[1342] Partington, G., Satchell, S., *Report to the AER: Discussion of the allowed cost of debt*, 5 May 2016, pp. 15–16, 22–23

[1343] AGN, *Revised access arrangement proposal—Attachment 10.26 Response to draft decision: Rate of return*, 6 January 2016, p. 42; CEG, *Curve testing and selecting averaging periods: A report for AGN*, January 2016, pp. 12–14.

[1344] AER, *Rate of return guideline*, December 2013, p. 21.

[1345] AGN, *Revised access arrangement proposal—Attachment 10.26 Response to draft decision: Rate of return*, 6 January 2016, p. 41; CEG, *Curve testing and selecting averaging periods: A report for AGN*, January 2016, pp. 13–14.

complexity to the return on debt process, regardless of the computational intensity associated with implementing it. We are satisfied that using a single averaging period (that is consistent with the Guideline conditions) to estimate the return on debt each year satisfies the rules. This contributes to the achievement of the allowed rate of return objective.

- AGN's proposed approach has similarities with other service providers' proposals to adopt an annual process for nominating averaging periods. Namely, we consider it increases complexity and overstates the risks in our approach. Therefore, similar reasoning applies to AGN's proposal as that outlined under 'Annual process for nominating debt averaging periods' above. We are satisfied that our approach, which includes the nomination of single averaging periods, provides an appropriate balance between flexibility and certainty.
- We discussed CEG's submission that the prevailing DRP and base rates of interest are inversely correlated in appendix G of our draft decision for AGN.[1346] Given AGN (or CEG) has not responded to this point and we do not base our return on debt on a particular financing strategy, we do not reproduce this material in this decision.

Guideline condition—as close as practically possible to the commencement of each regulatory year

In its initial proposal, AusNet Services (AusNet) proposed to depart from the Guideline in relation to nominating averaging periods that are as close as practical to the commencement of each regulatory year in a regulatory period (the 'Guideline condition').[1347] Instead, AusNet proposed to nominate averaging periods in the early, middle or late part of each relevant year. AusNet has maintained this position in its revised proposal.[1348]

The service providers who originally proposed an annual process to nominating their averaging periods also implicitly departed from this Guideline condition. JEN and ActewAGL continue to implicitly depart from this Guideline condition in their revised proposals. This is because all of these proposals specified a timeframe (of up to 12 months) within which they can nominate an averaging period for each regulatory year t.[1349] While these timeframes end close to the commencement of each regulatory year

1346 AER, *Draft decision: Australian Gas Networks access arrangement 2016 to 2021: Attachment 3—Rate of return*, November 2015, section G.8.1.

1347 AusNet, *Regulatory proposal*, 30 April 2015, p. 346.

1348 AusNet, *Revised regulatory proposal*, 6 January 2016, p. 177.

1349 United Energy, *Regulatory proposal—Rate of return on debt attachment*, 30 April 2015, pp. 31–36; JEN*, Regulatory proposal—Attachment 9-2: Rate of return proposal*, 30 April 2015, pp. 101–102; CitiPower, *Regulatory proposal*, 30 April 2015, pp. 235–238; Powercor, *Regulatory proposal*, 30 April 2015, pp. 243–246; ActewAGL, *Access arrangement proposal—Appendix 8.01: Detailed return on debt proposal*, 1 July 2015, pp. 15–17. Also see JEN*, Revised regulatory proposal—Attachment 6-1: Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, pp. 36–37; ActewAGL, *Revised access arrangement proposal: Appendix 5.01—Detailed response to rate of return, gamma and inflation*, January 2016, pp. 46–47.

t, there are no conditions in the process which specify that the nominated averaging periods must fall at the end of the timeframe.

In this decision we have assessed AusNet's submission and accept this departure from the Guideline condition. This is consistent with our preliminary decision for AusNet.[1350] We also accept the other service providers' departure from this Guideline condition. We consider allowing averaging periods to occur anytime within a reasonable timeframe (of 12 months) is consistent with a return on debt averaging period that satisfies the rules. This contributes to the achievement of the allowed rate of return objective. Our decision is based on the following reasoning:

- The Guideline approach to estimating the return on debt is significantly different to the previous approach under the old rules. Under the old rules (on-the-day approach), the return on debt was estimated once for the entire regulatory period. Therefore, the return on debt of a service provider was estimated as the prevailing return on debt as close as possible to the start of the regulatory period.[1351] The same averaging periods was also used for both return on equity and return on debt. Under this approach, the averaging period should to be as close as practically possible to the commencement of the regulatory period. We continue to hold this position for the return on equity averaging period. However, under the new rules we have proposed and adopted a trailing average approach with annual updates.[1352] This estimates the return on debt as a weighted average of the total return on debt over a period (10 years) spanning up to the start of the regulatory period (or regulatory year).[1353] Under this approach, we consider it is less important for the debt averaging periods to be as close as practically possible to the commencement of each regulatory year in the regulatory period. This is because the return on debt is updated each year, and because a different (or potentially different) averaging period is now used for the return on equity and return on debt.
- Relaxing the Guideline condition gives service providers more flexibility in nominating averaging periods without adding significant complexity. In its initial proposal, AusNet submitted:[1354]

  > …to align actual debt practices with the trailing average approach, it is necessary to align the timing of debt issuance with the timing of the averaging periods used to estimate the regulated return on debt.

  We do not agree that our task is to align actual debt practices with the trailing average approach. This is because we are estimating the return on debt for a benchmark efficient entity and consider the ARORO requires us to set ex-ante

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[1350] See AER, *Preliminary decision: AusNet Services determination 2016 to 2020—Attachment 3: Rate of return*, October 2015, pp. 601–602.

[1351] AER, *Explanatory statement to the rate of return guideline*, December 2013, p. 104.

[1352] We have also proposed and adopted a full transition into the trailing average approach. This starts with an on-the-day rate for the first regulatory year and gradually transitions into a trailing average approach over 10 years.

[1353] AER, *Explanatory statement to the rate of return guideline*, December 2013, p. 108.

[1354] AusNet, *Regulatory proposal*, 30 April 2015, p. 346.

compensation for efficient financing costs. We are aware of the rules requirement to have regard to the desirability of minimising any difference between the return on debt and the return on debt of a benchmark efficient entity (although we do not consider this permits us to set a return on debt that does not satisfy the ARORO).[1355] We are also aware of the service providers' proposals, which generally advocate for more flexibility in the return on debt estimation process. While we do not agree with many of the service providers' proposed methods to increase flexibility (see above), we consider this decision allows greater flexibility with very little additional complexity of process.

[1355] NER, cl. 6.5.2(k)(1) and 6A.6.2(k)(1); NGR, r. 87(11)(1).

J Methodology to annual update the return on debt

Our decision on the return on debt approach is to:

- estimate the return on debt using an on-the-day rate (that is, based on prevailing market conditions) in the first regulatory year (2016) of the 2016–20 period, and
- gradually transition this rate into a trailing average approach (that is, a moving historical average) over 10 years.[1356]

Because our return on debt approach involves annual updates to the return on debt, this means that the return on debt will be, or potentially will be, different for different regulatory years in the regulatory control period.[1357] The rules require that the resulting change to JEN's annual building block revenue requirement is to be effected through a formula specified in the distribution determination.[1358] For the purposes of clause 6.5.2(L) our final decision is that the resulting change to JEN's annual building block revenue requirement is to be effected through:

- the automatic application of the return on debt methodology specified in this appendix
- using the return on debt averaging periods specified in confidential appendix L, and
- implemented using JEN's final determination post-tax revenue model (PTRM) in accordance with section 3 of the AER's PTRM handbook for distribution network service providers.[1359]

The return on debt methodology in this appendix specifies our final decision:

- methodology on the return on debt approach, and
- methodology to implement the return on debt approach

J.1 Approach to estimating the return on debt

This section sets out our final decision methodology on the return on debt approach. Below we specify the allowed return on debt formulae for each year of the 10 year transition path. In each formula:

1356 This final decision determines the return on debt methodology for the 2016–20 period. This period covers the first five years of the 10 year transition period. This decision also sets out our intended return on debt methodology for the remaining five years. However, we do not have the power to determine in this decision the return on debt methodology for those years. Under the NER, the return on debt methodology for that period must be determined in future decisions that relate to that period.

1357 NER, cl.6.5.2(i) and cl.6A.6.2(i); NGR r. 87(9)

1358 NER, cl.6.5.2(l) and cl. 6A.6.2(l); NGR r. 87(12)

1359 AER, *Final decision—Amendment—Electricity DNSPs PTRM handbook*, 29 January 2015.

$_{a}R_{a+10}$ corresponds to the estimated return on debt that was entered into in year a and matures in year a+10–which is to be calculated using the return on debt implementation methodology in section J.2 and the service provider's return on debt averaging periods specified in confidential appendix L

$_{b}kd_{b+1}$ refers to the allowed return on debt for regulatory year b+1.

In the first regulatory year of the transitional period (2016), the allowed rate of return on debt will be based on the estimated prevailing rate of return on debt for that year (similar to the 'on the day' approach):

$$_{0}kd_{1} \ = \ _{0}R_{10}$$

In the second regulatory year, the allowed rate of return on debt will be the weighted average of the prevailing rates in the first and second regulatory years of the transitional period:

$$_{1}kd_{2} \ = 0.9 \cdot \ _{0}R_{10} + 0.1 \cdot \ _{1}R_{11}$$

In the third regulatory year, the allowed rate of return on debt will be the weighted average of the prevailing rates in the first, second, and third regulatory years of the transitional period:

$$_{2}kd_{3} \ = 0.8 \cdot \ _{0}R_{10} + 0.1 \cdot \ _{1}R_{11} + 0.1 \cdot \ _{2}R_{12}$$

In the fourth regulatory year, the allowed rate of return on debt will be the weighted average of the prevailing rates in the first, second, third and fourth regulatory years of the transitional period:

$$_{3}kd_{4} \ = 0.7 \cdot \ _{0}R_{10} + 0.1 \cdot \ _{1}R_{11} + 0.1 \cdot \ _{2}R_{12} + 0.1 \cdot \ _{3}R_{13}$$

In the fifth regulatory year, the allowed rate of return on debt will be the weighted average of the prevailing rates in the first, second, third, fourth and fifth regulatory years of the transitional period:

$$_{4}kd_{5} \ = 0.6 \cdot \ _{0}R_{10} + 0.1 \cdot \ _{1}R_{11} + 0.1 \cdot \ _{2}R_{12} + 0.1 \cdot \ _{3}R_{13} + 0.1 \cdot \ _{4}R_{14}$$

The calculation for all subsequent regulatory years until the transitional period is completed is set out below:

$$_{5}kd_{6} \ = 0.5 \cdot \ _{0}R_{10} + 0.1 \cdot \ _{1}R_{11} + 0.1 \cdot \ _{2}R_{12} + 0.1 \cdot \ _{3}R_{13} + 0.1 \cdot \ _{4}R_{14} + 0.1 \cdot \ _{5}R_{15}$$

$$_{6}kd_{7} \ = 0.4 \cdot \ _{0}R_{10} + 0.1 \cdot \ _{1}R_{11} + 0.1 \cdot \ _{2}R_{12} + 0.1 \cdot \ _{3}R_{13} + 0.1 \cdot \ _{4}R_{14} + 0.1 \cdot \ _{5}R_{15} + 0.1 \cdot \ _{6}R_{16}$$

$$_{7}kd_{8} \ = 0.3 \cdot \ _{0}R_{10} + 0.1 \cdot \ _{1}R_{11} + 0.1 \cdot \ _{2}R_{12} + 0.1 \cdot \ _{3}R_{13} + 0.1 \cdot \ _{4}R_{14} + 0.1 \cdot \ _{5}R_{15} + 0.1 \cdot \ _{6}R_{16} + 0.1 \cdot \ _{7}R_{17}$$

$$_{8}kd_{9} \ = 0.2 \cdot \ _{0}R_{10} + 0.1 \cdot \ _{1}R_{11} + 0.1 \cdot \ _{2}R_{12} + 0.1 \cdot \ _{3}R_{13} + 0.1 \cdot \ _{4}R_{14} + 0.1 \cdot \ _{5}R_{15} + 0.1 \cdot \ _{6}R_{16} + 0.1 \cdot \ _{7}R_{17} + 0.1 \cdot \ _{8}R_{18}$$

$$ {}_{9}kd_{10} = 0.1 \cdot {}_{0}R_{10} + 0.1 \cdot {}_{1}R_{11} + 0.1 \cdot {}_{2}R_{12} + 0.1 \cdot {}_{3}R_{13} + 0.1 \cdot {}_{4}R_{14} + 0.1 \cdot {}_{5}R_{15} + 0.1 \cdot {}_{6}R_{16} + 0.1 \cdot {}_{7}R_{17} + 0.1 \cdot {}_{8}R_{18} + 0.1 \cdot {}_{9}R_{19} $$

J.2 Implementing the return on debt approach

This section sets out our final decision methodology to implement the return on debt approach. This section specifies:

- our choice of data series
- extrapolation and interpolation issues with adjusting our choice of data series
- step-by-step calculation to calculating the final RBA and BVAL estimate
- contingencies associated with implementing our choice of data series, if the data series we have chosen to estimate the return on debt are unavailable or change in future regulatory years

J.2.1 Choice of data series

Our final decision on the choice of data series is to adopt a simple average of the debt data series published by the RBA and Bloomberg that match, as close as available, our benchmarks of a BBB+ credit rating and a 10 year debt term. Specifically our final decision is to adopt a simple average of:

- The RBA broad-BBB rated 10 year curve, extrapolated to an effective term of 10 years (the RBA curve)
- The Bloomberg Valuation Service (BVAL) broad-BBB rated curve (the BVAL curve). Depending on the maximum term published at the time, this will be either the BVAL:
  - 10 year estimate[1360] where it is available
  - 7 year estimate extrapolated to a 10 year term using the 7–10 year margin from the RBA curve. This will be used where the 7 year estimate is available and the 10 year estimate is not available.
  - 5 year estimate extrapolated to a 10 year term using the 5–10 year margin from the RBA curve. This will be used where the 5 year estimate is available and neither the 10 year nor the 7 year estimates are available.

We do not estimate the allowed return on debt in this decision by reference to the 10 year yield curve published by Thomson Reuters (the Reuters curve). Nonetheless, we do not rule out including the Reuters curve in future determinations following a proper period of consultation. See appendix I for our reasoning and further details.

[1360] As of 14 April 2015, Bloomberg has revised its methodology for the BVAL curve (BVCSAB10). It has correspondingly recommenced publishing a 10 year yield estimate.

J.2.2 Choice of data series—Extrapolation and interpolation issues

Our decision on extrapolation and interpolation issues is to maintain the approach set out in our draft decision. This refers to:

- extrapolation—where we need to extend a curve beyond its observed or published range. For example, before April 2015, Bloomberg publishes its BVAL curve to a maximum term of 7 years, whereas we require an estimate for a 10 year term.
- Interpolation—where we need a value for which there is no published estimate but it lies between two published estimates. For example, the RBA only publishes its curve estimates for one day each month, but we require estimates for each business day.

Specifically, we will make the following adjustments as set out in Table 3-46 and Table 3-47.

Table 3-46 Adjustments to the RBA curve

Adjustment type	Amendment made?	Comments
Interpolation to construct daily estimates	Yes	The RBA curve only provides an estimate for one business day at the end of each month. In our experience, averaging periods commonly start and/or end on dates during the month. We will address this issue by linearly interpolating between month end values where possible. While we are satisfied that interpolation over business days is also reasonable, we will interpolate over all days because: • this is consistent with our widely accepted approach to interpolate estimates of the risk free rate using CGS • interpolating over all days is simpler to implement • it is impractical to interpolate over business days for estimating the risk free rate, as this would require calculations relative to specific trading days 10 years in advance • the difference to the estimates between interpolating over business days or interpolating over all days is immaterial.[1361] Where this is not practical due to timing, we will hold the last available RBA monthly estimate constant until the end of the averaging period. It would not be practical to linearly interpolate between two RBA monthly estimates where the allowed return on debt must be estimated and incorporated into the annual debt update process before the publication of the next RBA monthly estimate after the end of the averaging period. Our final decision on the annual debt update process is set out in this appendix.
Extrapolation to target term	Yes	The 'effective term' of the RBA bond sample is commonly less than 10 years. For this reason, Lally recommended that the spread component of the yield

[1361] For example, the difference between approaches between 2 June 2014 to 30-June 2014 was 22 basis points, which means it would have changed the return on debt by 0.0022 per cent.

Adjustment type	Amendment made?	Comments
		should be extrapolated from its effective term at publication to the benchmark term (10 years).[1362] We agree with Lally's recommendation to extrapolate the spread component of the RBA's published yield in order to match it with the benchmark term of debt. However, we do not agree it is necessary to extrapolate the base component. As identified by the RBA and Lally,[1363] the base component of the published 10 year yield already matches the benchmark term of debt. Therefore, extrapolating this component would result be erroneous and lead to overcompensation in most circumstances, where the yield curve is upward sloping.
Conversion to effective annual rate	Yes	The RBA's published methodology does not explicitly specify whether the published yields should be interpreted as effective annual rates. Effective annual rates are a consistent basis on which to compare bond rates and imply that the coupon payments compound during the year. We therefore consulted the RBA, who informed us that 'the spreads and yields in F3 can be best thought of as annual rates with semi-annual compounding'.[1364] Therefore, this would require conversion into an effective annual rate, using the same approach as is applied to the BVAL yield estimate.

Source: AER analysis

Table 3-47 Adjustments to the BVAL curve

Adjustment type	Amendment made?	Comments
Interpolation to construct daily estimates	No	Bloomberg publishes daily estimates.
Extrapolation to target term	Depends on maximum term published by Bloomberg	For most of the time that the BVAL curve has been published, it has had a maximum term of 7 years. However, between September 2014 and November 2014, it was published to a maximum 5 year term.[1365] In April 2015, Bloomberg revised its methodology for the BVAL curve (BVCSAB10) and it now publishes a 10 year estimate.[1366] For the periods where 7 years is the maximum term, we extrapolate the spread component of the 7 year yield estimate to the 10 year target term. We have done so using the margin between the spread components of the extrapolated RBA 7 and 10 year yield estimates, converted to effective annual rates. We add to this extrapolation the difference between the base CGS estimates from 7 to 10 years. That is:

1362 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

1363 See the 'notes' tab in RBA, *Aggregate measures of Australia corporate bond spreads and yields*, available at: http://www.rba.gov.au/statistics/tables/xls/f03hist.xls; Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

1364 RBA, *Email in response to: AER follow up question on the basis of YTM quotations in RBA statistical table F3*, 16 October 2014.

1365 Specifically, from 15 September 2014 to 3 November 2014.

1366 Specifically, 14 April 2015.

Adjustment type	Amendment made?	Comments
		BVAL yield 10 years = BVAL yield 7 years + difference in CGS from 7 to 10 years + difference in RBA extrapolated spread to CGS from 7 to 10 years As recommended by Lally,[1367] we are satisfied this approach is comparably reliable to the more complex approaches submitted by other stakeholders,[1368] but is simpler to implement and based on publicly available data. For the period where 5 years is the maximum term, we extrapolate the spread component of the 5 year yield estimate to the 10 year target term using an analogous methodology to that used to extrapolate from 7 to 10 years. For the period where 10 years is the maximum term, we do not extrapolate the estimate.
Conversion to effective annual rate	Yes	Bloomberg publishes its yield as annual rates with semi-annual compounding. This needs to be converted into an effective annual rate.

J.2.3 Choice of data series—Step-by-step guide to calculations

Below we describe the step-by-step processes of calculating:

- the adjusted RBA estimate
- the adjusted BVAL estimate
- the final estimate—where we combine our implementations of the RBA estimate and the BVAL estimate.

These formula steps relate to the approach specified in this final decision. In the event that data availability changes during the regulatory control period, the formulas below will change to reflect the contingencies set out in section J.2.4.

For the purposes of calculating the return on debt, a 'business day' is a day that is not a Saturday or Sunday and not a national or NSW public holiday. This is because the independent data service providers (RBA and Bloomberg) do not publish data on national or NSW public holidays.

Calculation of the adjusted RBA estimate

1. Download RBA table F3—'Aggregate measures of Australian corporate bond yields' from the RBA website.

[1367] Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38–44.
[1368] Incenta, *Methodology for extrapolating the debt risk premium*, June 2014, pp. 2–3.

2. From this file, download the 7 and 10 year 'Non-financial corporate BBB-rated bonds—Yield' entries for dates:

   a. from the most recent published RBA date prior to the commencement of the nominated averaging period for debt

   b. to the first published RBA date following the conclusion of the nominated averaging period for debt

   c. all published dates between a. and b.

3. Download, from RBA table F16—'Indicative Mid Rates of Australian Government Securities - 2013 to Current', daily yields on CGSs for dates within the service provider's averaging period.

4. Linearly interpolate between the two nearest bonds straddling 7 years remaining term to maturity,[1369] and the two nearest CGS bonds straddling 10 years remaining term to maturity. This should be done using the following formula: [1370]

   yield interpolated = yield lower straddle bond + (yield upper straddle bond - yield lower straddle bond) * (date 10 years from interpolation date - maturity date lower straddle bond) / (maturity date upper straddle bond - maturity date lower straddle bond).

5. Linearly extrapolate the published RBA 10 year yield (from step 2) from its published effective term to an effective term of 10 years using the formula below:[1371]

   $\text{yield}_{10} = \text{yield}_{10\ \text{year published}} + [(\text{spread to swap}_{10\ \text{year published}} - \text{spread to swap}_{7\ \text{year published}})/(\text{effective term}_{10\ \text{year published}} - \text{effective term}_{7\ \text{year published}})] * (10 - \text{effective term}_{10\ \text{year published}})$.

6. Linearly extrapolate the published RBA 7 year yield (from step 2) from its published effective term to an effective term of 7 years using the formula below:[1372]

   yield_{7} = yield_{7} year published + [(spread to swap_{10} year published - spread to swap_{7} year published)/(effective term_{10} year published - effective term_{7} year published)] * (7 - effective term_{7} year published).

7. Subtract from the extrapolated 10 year RBA yield on each publication date the interpolated CGS yield on that date. For the 10 year term, use the RBA series as adjusted in step 5. These are the adjusted RBA 10 year spreads.[1373]

[1369] That is, the bond with the nearest maturity date that is earlier than 10 years from the interpolation date, and the bond with the nearest maturity date than is later than 10 years from the interpolation date.

[1370] This formula relies on the operation in Microsoft Excel. Dates can be subtracted from one another to work out the number of days in between two dates.

[1371] As per Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

[1372] As per Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

[1373] We have re-calculated the published 'spread to CGS' by subtracting our estimate of the interpolated CGS, as calculated in step 4, from the RBA's published yield to maturity. This allows us to combine daily data from the CGS

8. Obtain daily RBA spread estimates by linear interpolation of the adjusted RBA spreads (from steps 5 and 6) for both 7 and 10 year terms between the published dates identified in step 2. Use the adjusted RBA spread estimates as calculated in step 6. This should be done using the following formula:

   $spread_{\text{interpolated}} = spread_{\text{first straddling publication date}} + (date_{\text{interpolation}} - date_{\text{first straddling publication date}}) * (spread_{\text{second straddling publication date}} - spread_{\text{first straddling publication date}}) / (date_{\text{second straddling publication date}} - date_{\text{first straddling publication date}})$

   Note: If the annual return on debt estimate must be finalised before a final published RBA month-end estimate is available, hold the last observed RBA spread constant to the end of the averaging period.

9. Add to these daily spreads (from step 8), daily interpolated estimates of the CGS (from step 4) for all business days in the service providers averaging period. Specifically:

   a. add the 7 year interpolated CGS estimates to the 7 year interpolated RBA spreads. These are the interpolated RBA daily 7-year yield estimates.

   b. add the 10 year interpolated CGS estimate to the 10 year interpolated RBA spread. These are the interpolated RBA daily 10-year yield estimates.

10. Convert the interpolated daily yield estimates (from step 9) to effective annual rates, using the formula:[1374]

    effective annual rate = $((1 + \text{yield} / 200)^2 - 1)*100$

11. Average the yield estimate for the 10 year RBA yield estimate over all business days in the service provider's averaging period. This is our adjusted RBA estimate.

Calculation of the adjusted BVAL estimate

1. For dates after 14 April 2015, download the 10 year Corporate BBB rated Australian BVAL curve (BVCSAB10). For dates before 14 April 2015, Download from Bloomberg the 7 year Corporate BBB rated Australian BVAL curve (BVCSAB07 index) for all business days in the service provider's averaging period.[1375]

with an estimate of the spread calculated correctly with reference to both the RBA's yield estimate and our estimate of CGS.

[1374] In this formula, the term 'published yield / 200' is based on the yield being published as a number (e.g. 2.0) rather than a percentage (e.g. 2 %, or 0.02). The RBA yield data is published in this form at the time of this decision. For example, where the yield is published as '2.0', this is equivalent to 2 per cent or 0.02. However, it is necessary to convert from the published yield to either alternative to calculate the effective annual rate. If the spread was published as 2 per cent, this term would be 'published spread/2'.

[1375] Subject to the availability of the Bloomberg BVAL curve. For other contingencies, see section J.2.4.

2. For dates before 14 April 2015, add to the 7 year yield the difference between the 7 and 10 year daily RBA adjusted yields (as calculated in step 8 of the RBA process). This is the extrapolated daily estimate of the BVAL 10 year yield.[1376]

3. For all dates, convert the 10 year yields into effective annual rates, using the formula:

   effective annual rate = $((1 + \text{yield} / 200)^2 - 1)*100$

4. Average the extrapolated daily estimates of the BVAL 10 year yield over all business days in the service provider's averaging period. This is our adjusted BVAL estimate.

Final estimate

Take the simple average of the adjusted RBA estimate (from step 11 in the RBA data section) and the adjusted BVAL estimate (from step 4 in the BVAL data section). This is the annual estimate of the return on debt.

J.2.4 Choice of data series—Contingencies

Our decision is to largely maintain the set of contingencies as set out in our recent decisions.

We have made our decision based on the information and third party data that is currently available, subject to consultation and review.[1377] For clarity, we do not estimate the allowed return on debt with reference to one particular third party data series (the Reuters curve), which we have had limited opportunity to consult on using or to review.[1378]

We have set out a series of contingencies. This is important because the availability of third party data can change and we have determined to annually update the trailing average portfolio return on debt. Under the rules, the change in revenue resulting from the annual update must occur by automatic application of a formula that is specified in the decision.[1379] This means that our decision on how to apply these third party data sources must be fully specified upfront in the determination, and must be capable of application over the regulatory control period without the use of subsequent judgement

[1376] If only the 5 year BVAL curve is available, adjust necessary steps to perform the same process using the margin between the adjusted 5 and 10 year RBA yields.

[1377] As of 14 April 2015, Bloomberg has revised its methodology for the BVAL curve (BVCSAB10). It has correspondingly recommenced publishing a 10 year yield estimate.

[1378] Thompson Reuters publishes a BBB par yield curve to 10 years from 25 May 2015 (BBBAUDBMK Par Yield). However, we have had limited opportunity to review and consult on f this information as this was first put before us with the revised regulatory proposals in January 2016. Nevertheless, we have performed a preliminary assessment of this information (see Appendix I). This indicates that the Reuters curve would produce comparable estimates to the existing combination. We do not rule out including the Reuters curve in future determinations following a proper period of consultation.

[1379] NER cl. 6.5.2(l) and cl. 6A.6.2(l), NGR, r.87(12).

or discretion. For this reason, we have set out a series of contingencies in Table 3-48 below. These describe how we propose to estimate the annual return on debt in the event of revisions in the RBA's or Bloomberg's methodologies or other changes to data availability.

Table 3-48 Contingency approaches to choice of data series

Event	Changes to approach
Either the RBA or Bloomberg ceases publication of Australian yield curves that reflect a broad BBB rating.	We will estimate the annual return on debt using the remaining curve.
A different third party commences publication of a 10 year yield estimate (or we are made aware of a different third party publishing a 10 year yield estimate).[1380]	We will not apply estimates from a third party data provider that we have not evaluated and included in our final decision approach. We will consider any new data sources in future determinations.
Either Bloomberg or RBA substitutes its current methodology for a revised or updated methodology.	We will adopt the revised or updated methodology. Then, at the next regulatory determination, we will review this updated methodology. As noted above, we would also review any new data sources. However, if Bloomberg or the RBA backcasts or replaces data using a revised or updated methodology we will not use the backcasted data to re-estimate our estimates of the prevailing return on debt for previous years. This would be impractical and would create regulatory uncertainty over whether the allowed return on debt would at some point in the future be re-opened. Instead, we will continue to use the Bloomberg or RBA data that we downloaded at the time of estimating the prevailing return on debt for that point in time.[1381]
Bloomberg reduces the maximum published BVAL term from 10 years.	If Bloomberg still publishes the BVAL curve to 5 or more years, we will extrapolate the BVAL curve from the longest published term using the 5 to 10 year yield margin from the RBA curve. If Bloomberg no longer publishes the BVAL curve to 5 years, we will rely entirely on the RBA curve.
The RBA ceases publication of	If the RBA ceases publication of a 10 year yield estimate, we will extrapolate the

[1380] Or we determine it is open to us to use the Reuters curve, following a proper assessment and period of consultation on this information.

[1381] For example, for the current decisions we downloaded the RBA monthly data observation for August 2015 shortly after it was published (in September), and incorporated this data point into our prevailing return on debt estimates. After the RBA published its monthly observation for September (in October), we downloaded this data point too. This final data point is only relevant for estimation of AusNet's placeholder averaging period. In doing so, we noticed that it appears the RBA has revised its methodology (though does not appear to have explained this change), and has backcast its monthly observations for the entire data series which starts in January 2005. However, we have not incorporated this backcasted RBA data into our return on debt estimates. Instead, we have continued to use the data we downloaded at the time of estimation. We note that if we had incorporated the backdated RBA data this would have decreased the allowed return on debt for the Queensland, SA and Victorian electricity distributors by between approximately 1-2 basis points. Accordingly, in this instance, our approach of not using the backdated data is in this group of service providers' interests. Our approach will be symmetrical and consistent over time, so we will not use backcast data that results from a change in the RBA or Bloomberg's methodology regardless of whether it is in or against the interests of particular groups of service providers or particular groups of consumers.

Event	Changes to approach
a 10 year yield estimate.	RBA estimate to 10 years using: • if available, the margin between spreads in the Bloomberg curve,[1382] from the RBA's longest published target term to 10 years • otherwise, the actual CGS margin from the RBA's longest published estimate to 10 years, plus the average DRP spread for the same term margin over the last month prior to the end of its publication.
The RBA commences publication of daily estimates.	We will cease interpolating the RBA monthly yields. Instead, we will estimate both the RBA yield and the RBA year extrapolation margin (used with the BVAL curve) using these daily estimates.
Either Bloomberg or the RBA publishes a BBB+ or utilities specific yield curve.	We will adopt the BBB+ or utilities curve in place of the provider's existing curve, on the basis that it is a closer fit to our benchmark efficient entity.

Source: AER analysis

In general, we have decided on these contingencies based on a series of guiding principles. These are that the contingency must:

- Be practically implementable—the rules require the automatic application of a formula to update the trailing average portfolio return on debt. As a result, we will be unable to analyse changes to the approaches or new approaches during the regulatory control period. Therefore, it is important that any contingency be practical and easily implementable.
- Use the curve in a form as close as possible to its published form—for example, in April 2015 Bloomberg commenced publication of a 10 year BVAL curve. Accordingly, for averaging periods where the 10 year estimate is available, we will adopt this estimate rather than the 7 year BVAL curve extrapolated with RBA data.
- Where necessary, rely on the independent expert judgement of the RBA and Bloomberg—In particular, where the RBA or Bloomberg makes changes to its methodology, we would prefer to evaluate these changes before concluding we are satisfied the curve still meets the criteria set out in the Guideline.[1383] However, this is not possible during the regulatory control period. In these circumstances, we therefore are faced with the two alternatives of ceasing to rely on the updated curve, or temporarily relying on the updated curve on the basis that we have assessed the data provider as credible. As we are satisfied that both the RBA and Bloomberg are credible and independent, but not that either curve is clearly superior, we consider it is preferable that we adopt the updated curve to limit stakeholders' exposure to the distinct characteristics of a single curve. This is consistent with our position of placing weight on both curves to minimise the mean squared error.

[1382] Specifically, the spread to CGS.

[1383] AER, *Explanatory statement–Rate of return guideline*, December 2013, pp. 23–24.

J.2.5 Timing of annual updates

Our decision is that an averaging period should occur within a timeframe of 10 business days to 12 months. This is consistent with the position we proposed in the Guideline.[1384] We have considered how the process to annually update the return on debt would align with the publication of distribution prices.[1385] The timing of publishing distribution prices affects how late an averaging period can end and still be implemented in practice.

Table 3-49 outlines the general process we propose to adopt for the annual debt update for distribution network service providers (distributors). Our assessment of the proposed averaging periods for distributors with current regulatory proposals or revised proposals has taken this process into account. We also propose to adopt this process for assessing the proposed averaging periods of other distributors in the future. We encourage submissions from stakeholders on this process, including from distributors with future regulatory determinations.

Table 3-49 Annual distribution debt update process

Step	Timing	Description of step	Reasons for timing
1	25 business days before a distributor submits its pricing proposal to us.	Averaging period ends on or before this date.	We determine the maximum practical end date of the averaging period from the timing of steps 2 and 3.
2	10 business days before a distributor submits its pricing proposal to us.	So the distributor can factor this into its annual pricing proposal, we inform it of updates on the return on debt, annual building block revenue requirement and X factor that incorporates the updated return on debt.	15 business days between steps 1 and 2 provides sufficient time for us to calculate (and provide quality assurance checks on the updated return on debt, revenue and X factor.
3	A distributor submits its pricing proposal to us on the date determined by the rules.	The distributor submits its pricing proposal to us for the relevant year.	10 business days between steps 2 and 3 is based on a service provider's advice regarding the minimum period it would require to factor the updated information into its prices. We are open to individual distributors requiring a longer period (or requesting a shorter period) to accommodate their internal processes.[1386]

Source: AER analysis.

[1384] AER, *Better regulation—Rate of return guideline*, December 2013, p. 21.

[1385] The electricity distribution service providers are required to submit to the AER a pricing proposal for each regulatory year of the regulatory control period. The gas distribution and transmission service providers are also required to submit to us an annual reference tariff variation proposal to meet the requirements of their specific access arrangements. As we are proposing to update service providers' allowed return on debt estimates on an annual basis, the updated annual return on debt estimates should be submitted and approved by us in advance of a service providers' annual pricing/tariff proposals. See: AER, *Explanatory statement to the draft rate of return guideline*, August 2013, p. 103.

[1386] We note that a longer (or shorter) time period would move back (or forward) the maximum practical end date of the averaging period by the same timeframe.

On the basis of the process outlined in Table 3-49, we consider an averaging period for estimating the return on debt for regulatory year t should fall within the following timeframe:

- end no later than 25 business days before a distributor submits its annual pricing proposal for year t to the AER
- commence no earlier than 12 months plus 25 business days before a distributor submits its annual pricing proposal for year t to the AER.[1387]

However, as set out in Table 3-49, we are open to individual distributors requiring a longer period (or requesting a shorter period) between steps 2 and 3 to accommodate their internal processes. We note that a longer (or shorter) time period would move back (or forward) the maximum practical end date of the averaging period by the same timeframe. For example, if a service provider requested 15 business days (instead of 10) for its internal processes, then its averaging period would need to end 30 business days (instead of 25) before the date the distributor must submit its annual pricing proposal to us.

The process outlined in Table 3-49 does not apply to the first regulatory year in the regulatory control period. This is because the distribution determination includes the X factor for the first year, which already incorporates the first year return on debt. Therefore, this process will generally apply to the subsequent years of a regulatory control period.

In Table 3-49, we propose calculating the return on debt, annual building block revenue requirement, and X factor in accordance with the formula in the distribution determination. Further, we propose informing the distributor of our calculations before it submits its annual pricing proposal. We consider this preferable to the alternative approach, where we would assess updates the distributor calculated itself and submitted with its annual pricing proposal. This alternative approach could significantly complicate the annual pricing approval process if we identify calculation errors and require the distributor to revise all its proposed prices. On the other hand, our approach focusses the annual pricing approval process on how the distributor has incorporated the revised X factor into its prices, rather than also assessing the revised X factor itself.

The above process factors in the date that the rules require distributors to submit their annual pricing proposals to us.[1388] In November 2014, the AEMC made a rule determination that affected this date.[1389] The AEMC determined that:

[1387] A further possible constraint on the start date is, as set out in the previous section, one of our conditions is at the time it is nominated all dates in the averaging period must take place in the future.

[1388] Clause 6.18.2(a)(2) of the NER requires electricity distributors to submit their annual pricing proposals to us at least 2 months before the commencement of the second and each subsequent regulatory year of the regulatory control period. For the Victorian distributors, each regulatory year commences at the start of the calendar year (1 January). For non-Victorian distributors, each regulatory year commences at the start of the financial year (1 July).

[1389] AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014.

- From 2017—distributors will be required to submit their annual pricing proposal to us by:[1390]
    - 31 March each year (non-Victorian distributors)
    - 30 September each year (Victorian distributors).
- Before 2017—transitional arrangements will maintain the current date by which distributors must submit their annual pricing proposals.[1391] This is by 1 May each year (non-Victorian distributors).[1392] For Victorian distributors, the new rules apply from the second regulatory year (2017) of the 2016–2020 regulatory control period, accordingly there are no transitional arrangements that effect the timing of the annual debt update process.[1393]

[1390] See AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014, pp. 57, 95, 103. Victorian distributors will be required to submit their annual pricing proposals to us no later than 30 September. This is because the pricing process in Victoria operates on calendar years, rather than financial years.

[1391] AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014, p. 103.

[1392] AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014, pp. 103, 110–112 (transitional arrangements for Victorian distributors), 112–113 (transitional arrangements for non-Victorian distributors).

[1393] NER, transitional clause 11.76.1(c).

K Equity and debt raising costs

In addition to compensating for the required rate of return on debt and equity, we provide an allowance for the transaction costs associated with raising debt and equity. We include debt raising costs in the opex forecast because these are regular and ongoing costs which are likely to be incurred each time service providers refinance their debt. On the other hand, we include equity raising costs in the capex forecast because these costs are only incurred once and would be associated with funding the particular capital investments.

Our final decision forecasts for debt and equity raising costs are included in the opex and capex attachments, respectively. In this appendix, we set out our assessment approach and the reasons for those forecasts.

K.1 Equity raising costs

Equity raising costs are transaction costs incurred when a service provider raises new equity from outside its business. We use a benchmark approach to determine these costs and this approach allows the costs of two means by which a service provider could raise equity from outside its business—dividend reinvestment plans and seasoned equity offerings. Equity raising costs are an unavoidable aspect of raising equity that a prudent service provider acting efficiently would incur. Accordingly, we provide an allowance to recover an efficient amount of equity raising costs. This is where a service provider's capex forecast is large enough to require an external equity injection to maintain the benchmark gearing of 60 per cent.

While the rate of return guideline does not set out an approach for estimating these costs, we apply an established method for estimating equity raising costs. We initially based our method for determining benchmark equity raising costs on the 2007 advice from Allen Consulting Group (ACG).[1394] We amended this method in our 2009 decisions for the ACT, NSW and Tasmanian electricity service providers.[1395] We further refined this approach, as discussed and applied in the 2012 Powerlink decision.[1396]

K.1.1 Final decision

We accept JEN's proposed approach to estimate equity raising costs but we have updated the estimates to reflect the final capex allowance. Capex is an input for calculating equity raising costs. Following these updates, we provide $5.3 million ($

[1394] ACG, *Estimation of Powerlink's SEO transaction cost allowance-Memorandum*, 5 February 2007.

[1395] AER, *Final decision, ACT distribution determination 2009–10 to 2013–14*, April 2009, appendix H; AER, *Final decision, NSW distribution determination 2009–10 to 2013–14*, April 2009, appendix N; AER, *Final decision, TransGrid transmission determination 2009–10 to 2013–14*, April 2009, appendix E; AER, *Final decision, Transend transmission determination 2009–10 to 2013–14*, April 2009, appendix E.

[1396] AER, *Final decision, Powerlink Transmission determination 2012-13 to 2016-17*, April 2012, pp. 151-152.

2015) of equity raising costs in the 2016–20 regulatory period. The AER PTRM we published with this decision sets out our calculation of equity raising costs.

JEN adopted our preliminary decision approach and proposed revised equity raising costs of $4.1 million ($ 2015).[1397]

K.2 Debt raising costs

Debt raising costs are transaction costs incurred each time debt is raised or refinanced. These costs may include arrangement fees, legal fees, company credit rating fees and other transaction costs. Debt raising costs are an unavoidable cost of raising debt that would be incurred by a prudent service provider, and data exists such that we can estimate them. Accordingly, we provide an allowance to recover an efficient amount of debt raising costs.

K.2.1 Final decision

We accept JEN's proposed approach to forecast debt raising costs. However, we have updated the estimates to reflect the final RAB and rate of return in this decision, which are inputs for calculating debt raising costs. We determine debt raising costs of $3.7 million ($ 2015) over the 2016–20 period, as set out in Table 3-50. We are satisfied this estimate contributes towards a total opex forecast that reasonably reflects efficient, prudent and realistic costs.

JEN adopted our debt raising costs approach set out in the preliminary decision but it rejected our rate of return and some aspects of capex, which affects the regulatory asset base (RAB).[1398] Our decision on the unit costs and components of JEN's benchmark rate of debt raising transaction costs is set out in Table 3-51.

Table 3-50 AER's preliminary decision on debt raising costs (million, $ 2015)

	2016	2017	2018	2019	2020	Total
Distribution	0.6	0.7	0.7	0.7	0.8	3.5
Metering	0.1	0.1	0.0	0.0	0.0	0.2
Total	0.7	0.8	0.7	0.7	0.8	3.7

Source: AER analysis.

Note: Columns may not add to total due to rounding for presentation in table.

1397 Jemena Electricity Networks, *Revised proposal Attachment 5.2 JEN SCS Distribution PTRM*, January 2016.

1398 Jemena Electricity Networks, *Revised Regulatory Proposal, Attachment 6-1 Rate of return, gamma, forecast inflation, and debt and equity raising costs*, January 2016, p.122.

Table 3-51 Benchmark debt raising costs (basis points per annum)

Number of bonds	Value	1 bond issued	3 bonds issued
Amount raised		$250m	$750m
Arrangement fee		7.23	7.23
Bond Master Program (per program)	$56,250	0.31	0.10
Issuer's legal counsel	$15,265	0.09	0.09
Company credit rating	$77,500	0.43	0.14
Annual surveillance fee	$35,500	0.14	0.05
Up-front issuance fee	5.20bp	0.72	0.72
Registration up-front (per program)	$20,850	0.12	0.04
Registration- annual	$7,825	0.31	0.31
Agents out-of-pockets	$3,000	0.02	0.02
Total (basis points per annum)		9.4	8.7

Source: AER, Incenta.[1399]

1399 Incenta, Economic Consulting, *Debt raising transaction costs: updated report–TransGrid*, January 2015.

L Equity and debt averaging periods (Confidential)