PRELIMINARY DECISION
Energex distribution determination
2015−16 to 2019−20

Attachment 3 – Rate of return

April 2015

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Note

This attachment forms part of the AER's preliminary decision on Energex's regulatory proposal 2015–2020. It should be read with all other parts of the preliminary decision.

The preliminary 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

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Contents

Shortened forms

Shortened form	Extended form
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
capex	capital expenditure
CAPM	capital asset pricing model
CCP	Consumer Challenge Panel
CGS	Commonwealth government securities
CPI	consumer price index
distributor	distribution network service provider
DGM	dividend growth model
DRP	debt risk premium
ERP	equity risk premium
FFM	Fama and French three-factor model
MRP	market risk premium
NEL	national electricity law
NEO	national electricity objective
NER	national electricity rules
NGL	national gas law
NGO	national gas objective
NGR	national gas rules
NSP	network service provider
opex	operating expenditure
PTRM	post-tax revenue model
RAB	regulatory asset base
RBA	Reserve Bank of Australia
RPP	revenue pricing principles
SLCAPM	Sharpe-Lintner capital asset pricing model
theta	the utilisation rate of dividend imputation credits
WACC	weighted average cost of capital

3 Rate of return

The allowed rate of return provides a network service provider (NSP) a return on capital to service the interest on its loans and give a return on equity to investors. 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 Preliminary decision

We are satisfied that the allowed rate of return of 5.85 per cent (nominal vanilla) we determined achieves the allowed rate of return objective.[1] 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 Energex in providing standard control services.[2]

This rate of return will apply to Energex for the 2015–16 regulatory year. A different rate of return will apply to Energex for the remaining years of the 2015–20 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 satisfied that this allowed rate of return reflects the overall efficient financing costs of a benchmark efficient entity with a similar degree of risk as Energex, for the reasons discussed in this attachment.

We are not satisfied that Energex's proposed (indicative) 7.75 per cent rate of return for the 2015–16 regulatory year has been determined such that it achieves the allowed rate of return objective.[3]

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 the estimate of the imputation credits.[4] Also, in arriving at our decision we have taken into account the revenue and pricing principles and are also satisfied that our decision will or is likely to contribute to the achievement of the National Electricity Objective (NEO).[5]

Our return on equity estimate is 7.1 per cent. This rate will apply to Energex in each regulatory year.[6] Our return on debt estimate for the 2015–16 regulatory year is 5.01 per cent. This estimate will change each year as we partially update the return on debt each year for prevailing debt market conditions. Our return on debt estimate for future regulatory years will be determined in accordance with the methodology and formulae we have

1 NER, cl. 6.5.2(b).
2 NER, cl. 6.5.2(c).
3 Energex, *Regulatory proposal*, October 2014, pp.152–177.
4 NER, cl. 6.5.2(d)(1) and (2).
5 NEL, s.16.
6 Subject to updating the placeholder risk free rate averaging period adopted for this preliminary decision

specified in this decision. As a result of updating the return on debt each year, the overall rate of return will also be updated.

We agree with the following aspects of Energex's 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)
- the risk free rate averaging period for estimating the return on equity[7]
- a gradual transition from the on-the-day approach to the trailing average approach
- 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, and specifically by adopting a simple average of the broad BBB rated Reserve Bank of Australia (RBA) and Bloomberg Valuation Service (BVAL) data series
- forecast inflation based on an average of the RBA's short term inflation forecasts and the mid-point of the RBA's inflation targeting band.[8]

However, we disagree with Energex on a number of other components of the rate of return.

Our return on equity estimate is 7.1 per cent.[9] We derived this estimate by applying the Rate of Return guideline (the Guideline) approach referred to as the foundation model approach.[10] This is an iterative six step process which has 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 Table 3-1. Energex proposed departing from the approach in the Guideline. We are not satisfied doing so would result in an outcome that better achieves the allowed rate of return objective.[11] We do not agree with Energex that it is necessary to depart from the Guideline in order to arrive at an estimate of the return on equity that meets the requirements of the rules.[12] Our return on equity preliminary decision is largely consistent with the views in the Guideline.

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

- estimate an on-the-day rate (that is, based on prevailing market conditions) in the first regulatory year (2015-16) of the 2015–20 period, and

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7 Group Manager Regulation and Pricing (Energex Ltd), *Letter: Rate of return averaging periods*, 29 January 2015 (Confidential).

8 Energex, *Regulatory Proposal*, October 2014, p. 176.

9 NER, cll. 6.5.2(c), (f) and (g).

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

11 NER, cl. 6.2.8(c).

12 Energex, *Regulatory proposal*, October 2014, p. 157.

- gradually transition this rate into a trailing average approach (that is, a moving historical average) over 10 years.[13]

This gradual transition will occur through updating 10 per cent of the return on debt each year to reflect prevailing market conditions in that year. Energex agrees with this approach.

Our preliminary 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 RBA and Bloomberg, adjusted to reflect a 10 year estimate and other adjustments
- 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 rate of return guideline.[14]

In the Guideline, we proposed to use one or more third party data series to estimate the return on debt.[15] 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. We have now formed a view on this issue and adopted a simple average of the RBA and Bloomberg data series.

Our formula for automatically updating the trailing average portfolio return on debt annually is set out in appendix I.[16]

Our preliminary decision individual WACC parameters are set out in Table 3-1.

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13 This final decision determines the return on debt methodology for the 2015–20 period. This period covers the first four 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.

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

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

16 NER, cl. 6.5.2(l).

Table 3-1 AER's preliminary decision on Energex's rate of return (nominal)

	AER decision 2010–15	Energex's proposal 2015–20	AER preliminary decision[a] 2015–16	AER preliminary decision[a] 2016–20
Nominal risk free rate (return on equity)[b]	5.89%	3.63%	2.55%	2.55%
Equity risk premium	5.20%	6.87%	4.55%	4.55%
MRP	6.50%	7.57%	6.50%	6.50%
Equity beta	0.8	0.91	0.7	0.7
Nominal post–tax return on equity	11.09%	10.50%	7.1%	7.1%
Nominal pre–tax return on debt	8.87%	5.91%	5.01%	Updated annually[c]
Gearing	60%	60%	60%	60%
Nominal vanilla WACC	9.76%	7.75%	5.85%[e]	Updated annually[c]
Forecast inflation	2.52%	2.52%	2.55%	2.55%

Source: AER analysis; Energex, *Regulatory proposal*, October 2014; AER, *Final decision: Queensland distribution determination 2010–11 to 2014–15*, May 2010.

(a) This rate of return estimate will be used to determine prices to apply in the 2015–16 regulatory year. The rate of return, including the rate to apply to the 2015–16 regulatory year, will be updated in our substitute determination for Energex.

(b) Energex's risk free rate estimate was calculated using an averaging period 20 business days to 11 July 2014. AER preliminary decision risk free rate estimate is based on a 20 business day averaging period from 9 February to 6 March 2015.

(c) The allowed return on debt is to be updated annually and the nominal vanilla WACC will be updated annually to reflect the allowed return on debt. The allowed return on debt for 2015–16 has already been estimated. Return on debt allowances for subsequent years will be estimated based on the formula set out in appendix I.

3.2 Energex's proposal

Return on equity

Energex proposed a return on equity estimate of 10.5 per cent.[17] Energex applied the AER's preferred foundation model (SLCAPM) to estimate the return on equity, but departed from the Guideline in the selection of SLCAPM parameter values (MRP and equity beta). Energex considered it necessary to depart from the Guideline to address weakness in the SLCAPM,

[17] Energex, *Regulatory proposal*, October 2014, p.152.

and to calculate the input parameters that would result in a rate of return that would contribute to the achievement of the allowed rate of return objective.

Specifically, Energex estimated its return on equity by parameterising the SLCAPM inputs in a manner that gave weight to four financial models—the SLCAPM, Black CAPM, Fama–French three factor model, and SFG's construction of the DGM.[18]

In support of its regulatory proposal, Energex submitted a report from SFG Consulting, Estimating the required return on equity, Report for Energex, 28 August 2014.

Return on debt

In its regulatory proposal, Energex proposed a placeholder return on debt of 5.91 per cent for the 2015–16 regulatory year based on a full transition to the trailing average approach.[19] To implement this approach, Energex proposed:[20]

- Using a BBB benchmark credit rating. This is different to the BBB+ benchmark credit rating we proposed in the Guideline.
- Weighting the debt raised each regulatory year by the proportion of the regulatory asset base (RAB) forecast for that year. This is a departure for the Guideline to equally weight the benchmark efficient entity's debt portfolio.
- Only using the RBA data series for estimating the return on debt. This is different to our position in the draft decisions published in 2014, where we proposed to estimate the return on debt using a simple average of the RBA and BVAL data series.
- Extrapolating the RBA yield curve using the AFMA swap rate plus the RBA spread to swap rate. This is a different approach to extrapolating the RBA curve to that in our draft decisions in December 2014.

To support its revised proposal, Energex submitted the following reports:

- QTC, *Extrapolating the RBA BBB curve to a 10-year tenor*, September 2014.
- QTC, *An alternative extrapolation method to estimate the 10-year BBB+ corporate yield: Attachment A*, September 2014.
- QTC, *Illustration of the practical implementation of a weighted average based on PTRM balances*, October 2014.
- Kanangra Ratings Advisory Services, *Credit ratings for regulated energy network services businesses*, June 2013.[21]

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18 Energex, *Regulatory proposal*, October 2014, p.155–165.

19 Energex, *Regulatory proposal* , October 2014, pp. 153, 175

20 For Guideline references, see AER, Rate of return guideline, December 2013, pp. 19, 21. For a December 2014 draft decision, see AER, *Draft decision: ActewAGL distribution determination, Attachment 3*, November 2014, pp. 10–11, 24.

21 This report was previously submitted during the Guideline development process.

3.3 AER's assessment approach

Our approach to determining the rate of return is set out in this section. This approach is based on the rate of return framework in the National Electricity Rules (NER). Under this framework, our key task is to determine an overall rate of return that we are satisfied achieves the allowed rate of return objective.[22] Prior to the submission of this regulatory proposal, as required by the rate of return framework, we published the Guideline.

An important feature of the rate of return framework is the recognition that there may be several plausible answers that may achieve the allowed rate of return objective. The Australian Energy Market Commission (AEMC) in its final rule determination considered that the estimation of the required rate of return could be improved by permitting us to take account of a broad range of information.[23] The AEMC specifically did not include in the new rules any preferred methods for determining the rate of return.[24] Instead it provided for us to exercise judgement as to what we are satisfied is the best approach.[25]

During the AEMC's rule development, the Energy Networks Association (ENA) submitted that the Guideline should provide a high level of certainty that enables stakeholders to calculate proxy estimates of the rate of return.[26] During the development of the Guideline, a group of investors and ENA again raised the importance of certainty.[27] In particular, the ENA submitted that certainty and stability of outcomes in rate of return issues could materially benefit the long term interest of consumers.[28] We have provided this certainty and predictability in the Guideline in a manner that it is consistent with achieving the allowed rate of return objective.

We are cognisant that our task is not to determine a rate of return that merely applies the Guideline. That is, we do not consider the Guideline to be the determinative instrument for calculating the rate of return. Rather, the allowed rate of return objective has primacy in our estimation of the rate of return. Nevertheless, the Guideline has a significant role at the time of each regulatory determination because any decision to depart from the Guideline must be a reasoned decision.[29] 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 allowed rate of return objective. Where no new material was submitted we maintain our view as expressed in the Guideline for reasons stated therein.

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22 NER, cl. 6.5.2(b).

23 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).

24 See, for example, AEMC, *Final rule change determination*, 29 November 2012, p. iv.

25 AEMC, *Final rule determination*, 29 November 2012, p. 38; The High Court of NZ stated: "In determining WACC, precision is therefore an elusive and perhaps non-existent quality. Setting WACC is, we suggest, more of an art than a science. The use of WACC, in conjunction with RAB values, to set prices and revenue in price-quality regulation gives significance to WACC estimates that may not exist outside this context." *Wellington International Airport Ltd & Others v Commerce Commission [2013] NZHC 3289, para. 1189*.

26 AEMC, *Final rule determination*, 29 November 2012, p. 50.

27 Financial Investors Group*, Submission on AER's equity beta issues paper*, 29 October 2013.

28 ENA, *Response to the Draft Rate of Return Guideline of the AER*, 11 October 2013, p. 1.

29 NER, cl. 6.2.8(c).

Whilst the legislative framework allows us to depart from the Guideline, we would not do so lightly. Departing from it may undermine the certainty and predictability that stakeholders have said they value. We would depart from the Guideline if we are satisfied that doing so would result in an outcome that better achieves the allowed rate of return objective. 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."[30] In its Rule determination, in relation to the Guideline the AEMC stated, "…the Commission would expect service providers, consumers, the AER, the ERA, and the appeal body to have significant regard to them as a starting point for each regulatory determination or access arrangement."[31]

The rate of return framework provides for us to take into account a wide range of relevant estimation methods, financial models, market data and other evidence as well as considering inter-relationships between parameter values.[32] This enables us to determine the estimate of the required rate of return at the time of each regulatory determination commensurate with prevailing conditions in the market for funds at that time.[33] The rate of return framework incorporates a greater degree of regulatory judgement than did the previous framework.[34] This framework does not include any preferred methods for estimating components of the rate of return. Instead, the AEMC in formulating the framework provided high-level principles to guide the estimation of the rate of return consistent with achieving the overall allowed rate of return objective.[35]

The Guideline was designed through extensive consultation. This process provided transparency and the Guideline provides 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 making regulatory determinations. The process included effective and inclusive consumer participation which we consider an important feature of our approach.

Energex submitted a large volume of material in support of its rate of return proposal. We have turned our mind to all of this material to consider its implications for addressing the allowed rate of return objective and whether we should depart from the Guideline. We have also referred this material to our consultants for their consideration prior to making our preliminary decision. Much of the material submitted by Energex is not new to us. Much of it was considered directly during the development of the Guideline and readdresses issues that were before us at the time. Nevertheless, we reviewed the material in making our preliminary decision. Our considerations are throughout this rate of return attachment and relevant appendices.

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30 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.

31 AEMC, *Final rule determination*, 29 November 2012, p. 71.

32 NER, cll. 6.5.2(e) & (k).

33 NER, cl. 6.5.2(g).

34 NER, cll. 6.5.2(b) & (c).

35 NER, cll. 6.5.2(b) & (c).

Although this decision relates to only Energex, we are simultaneously considering a number of rate of return proposals and revised proposals from different NSPs.[36] TasNetworks' original proposal did not propose any departures from the Guideline and applied it to determine its rate of return. TasNetworks and Directlink have accepted our return on equity draft decision. The other service providers proposed varying reasons, material and propositions to justify their proposed departures from the Guideline and to not accept our November 2014 draft decisions. We have had regard to the material in all of the different proposals and revised proposals in determining a return that achieves the allowed rate of return objective. Our considerations are throughout this rate of return attachment and appendices.

We note that Energex has challenged most aspects of the Guideline approach (and methods) to estimating the return on equity. We have engaged with the material submitted by Energex and reasons for the proposed departures from the Guideline. We have also considered material submitted since our November 2014 draft decisions, and taken into account stakeholder submissions. In doing so, we have undertaken two interdependent tasks which are consistent with the rules:

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

The remainder of our assessment approach is separated into the following subsections:

- Requirements of the law and rules.
- Rate of return guideline.
- Interrelationships within the rate of return.
- Expert advice and stakeholder submission.

3.3.1 Requirements of the law and rules

This section summarises the key aspects of the law and rules that underpin the rate of return framework.

Overall rate of return (weighted average cost of capital)

The allowed rate of return for a regulatory year must be 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 and must be determined on a nominal vanilla basis that is consistent with the estimate of the value of imputation credits (WACC).[37] The WACC formulae is:

[36] Revised proposals from Ausgrid, Endeavour Energy, Essential Energy, TasNetworks (accepted the Guideline), TransGrid, Directlink and Jemena Gas Networks (NSW) and initial proposals from Energex, Ergon Energy and SA Power Networks.

[37] NER, cl. 6.5.2(d).

1. $WACC_{vanilla} = E(k_e)\frac{E}{V} + E(k_d)\frac{D}{V}$

where:

- $E(k_e)$ is the expected required return on equity
- $E(k_d)$ is the expected required return on debt
- $\frac{E}{V}$ is the proportion of equity in total financing (comprising equity and debt).
- $\frac{D}{V}$ is the proportion of debt in total financing, and is equal to the benchmark efficient entity gearing ratio of 0.6.

In determining the allowed rate of return, we must have regard to:[38]

- relevant estimation methods, financial models, market data and other evidence;
- the desirability of using an approach that leads to the consistent application of any estimates of financial parameters that are relevant to the estimates of, and that are common to, the return on equity and the return on debt; and
- any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt.

Allowed rate of return objective

The allowed rate of return that we determine is to be determined such that achieves the allowed rate of return objective. The objective is[39]

> …that the rate of return for a [regulated network] 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].

National electricity objective and the revenue and pricing principles

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 national electricity objective.[40] A distribution determination, of which the rate of return is a constituent decision, is an AER economic regulatory function or power. The national electricity objective 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;

38 NER, cl. 6.5.2(e).

39 NER, cl. 6.5.2(c).

40 NEL, s. 16(1)(a).

(b) and the reliability, safety and security of the national electricity system.

In addition, we take into account the revenue and pricing principles when exercising discretion in making our decision relating to direct control network services.[41] In the context of the rate of return decision, we take particular account of the following revenue and pricing principles:

- A service provider should have a reasonable opportunity to recover at least the efficient costs that the operator (benchmark efficient entity) incurs in providing direct control network services.[42]
- 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.[43]
- A price or charge should allow for a return that matches the regulatory and commercial risks from providing the regulated service that charge relates.[44]
- 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.[45]
- 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.[46]

Return on equity

Our return on equity for a regulatory control period must be estimated such that it contributes to the achievement of the allowed rate of return objective. In estimating the return on equity, we have regard to the prevailing conditions in the market for equity funds.[47]

Return on debt

Our return on debt for a regulatory year must be estimated such that that it contributes to the achievement of the allowed rate of return objective.[48]

We 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.[49]

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41 NEL, s. 16(2).
42 NEL, s. 7A(2).
43 NEL, s. 7A(3).
44 NEL, s. 7A(5).
45 NEL, s. 7A(6).
46 NEL, s. 7A(7).
47 NER, cll 6.5.2(f) and (g).
48 NER, cl. 6.5.2 (h).

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 allowed rate of return objective
- 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 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.[50]

Make and publish the rate of return guideline

On 17 December 2013,[51] as required under the rules, we published the Guideline which is available on our website.[52] Within it we specified:[53]

- The methodologies we propose to use to estimate the allowed rate of return (derived from the expected return on equity and the return on 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 allowed rate of return objective.

In the Guideline we also set out the estimation methods, financial models, market data and other evidence that we propose to take into account in estimating the expected return on equity, return on debt and the value of imputation tax credits.[54] Network businesses must provide reasons in their revenue proposals for any proposed departures from the Guideline.[55] Should we decide to depart from the Guideline in a distribution determination then we must provide reasons for any such departures.[56]

3.3.2 Rate of return guideline

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

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49 NER, cl. 6.5.2 (i).
50 NER, cl. 6.5.2 (k).
51 http://www.aer.gov.au/node/18859
52 NER, cl. 6.5.2(m).
53 NER, cl. 6.5.2 (n).
54 NER, cl. 6..5.2 (n) (2).
55 NER, cl. S6.1.3(9),(9A),(9B).
56 NER, cl. 6.2.8(c).

section.[57] Where we have received proposals/submission to depart and/or departed from the Guideline, any such proposals/submissions and/or departures are explained and reasons for doing so are set out in section 3.4 and the appendices.

Consultative approach to designing the guideline

In developing the Guideline we undertook an extensive consultation process to provide stakeholders with opportunities to raise and discuss matters. We are satisfied that this comprehensive consultation process resulted in the Guideline addressing the relevant issues. One of the key benefits of this extensive consultative and inclusive process is that it provided stakeholders with greater certainty and predictability as to how we will assess proposals and determine the rate of return at each determination.

All the material including submissions received are available on our website, at the *Better Regulation Reform* page. A summary of submissions is set out in appendix I of the rate of return Guideline, explanatory statement.

An outline of the consultative process is set out below:[58]

- On 18 December 2012, we released an issues paper. This paper raised and sought comment on a broad range of issues at a high level with no firm positions taken by us. We received 20 submissions on the issues paper.
- On 5 February 2013, we hosted a forum on the development of the guideline. A range of stakeholders including representatives of regulated energy businesses, energy users, state regulatory authorities, government statutory authorities and investors in regulated utilities participated in this forum. At the forum we sought high level views from participants on key matters. Forum participants discussed issues set out in our issues paper. Stakeholders sought clarification on how we would apply the principles set out in the issues paper and explain how these principles related to the objectives and the revenue and pricing principles.
- On 25 and 26 February 2013 we held two sub-group workshops on: i) the overall rate of return and cost of equity ii) the cost of debt. Again a range of stakeholders attended these workshops and discussed the key issues relating to development of guideline including the role of the principles, the nature of the benchmark efficient entity, the use of financial models and approaches for estimating the cost of equity and cost of debt.
- In May 2013 we released a consultation paper. This paper sought comments on our preliminary positions on some elements of the rate of return. We received 41 submissions on the consultation paper.
- On 3 and 4 June 2013 we held two sub-group workshops on: i) approach to return on debt benchmark and ii) return on equity—models assessment. A large number of stakeholders attended these workshops. The debt workshop discussed the key issues

57 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 .

58 See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013, pp. 19–20.

relating to approach to return on debt: benchmark (‘on-the day’ and portfolio), trailing average, annual updating of a trailing average, weighting, and transitional arrangements. The equity workshop discussed various models used for assessing the return on equity.

- On 18 June 2013 we held another workshop on relationship between risk and the rate of return, and implications for the definition of the benchmark efficient entity. Again a large number of stakeholders and the consultants attended this workshop. Frontier Economics made presentations on: i) characteristics and exposures of energy networks in general and ii) differences in risk exposures of different types of energy networks. Associate Professor Graham Partington made a presentation on accounting for risk within the regulatory framework. The consultants also responded to the stakeholders questions.
- On 30 August 2013 we published our draft guideline and explanatory statement. In response to the draft guideline and accompanying explanatory statement we received 46 submissions. A key theme in submissions was requests for additional specification to be included in the guideline. This request came from a range of stakeholders, but most prominently from investors. Investors told us that it was important for them to be able to forecast our decision outcomes with a fair degree of precision to avoid surprises. These responses led us to include more details in the final Guideline included the parameter estimates we proposed to use when applying our foundation model.[59]
- On 30 August 2013, following the release of the draft rate of return guideline we held an information session presented by the previous AER Chairman, Andrew Reeves outlining the details of our draft guideline. We published a copy of the presentation and answers to all questions raised during the session.
- On 1 October 2013 we held a stakeholder forum to discuss our draft rate of return guideline. The forum provided interested stakeholders with an opportunity to clarify aspects of the draft guideline and to present their views on the draft guideline.
- On 11 October 2013, we released an issues paper on equity beta as part of our consultation for developing the rate of return guideline. This issues paper set out our proposed approach to estimating the equity beta. We received 14 submissions on this issues paper.
- We held a number of bilateral meetings during the process with the QTC, TCorp, ERA, IPART, APIA, EUAA, ENA, PIAC, Merrill Lynch, Moody's, Standard and Poor's, Goldman Sachs, Westpac.
- Throughout the process we held a series of meetings with the Consumer Reference Group to receive feedback from on key issues from a consumer perspective. Our past experience was that consumers struggled to participate in our regulatory processes. They find it difficult to engage with the complexity of the regulatory framework and then to provide written material that fits within the framework that governs our decision. Our objective in running the consumer reference group was to educate consumers, identify the key issues and gather their comments without the need for comprehensive written

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59 See AER, *Better regulation: Explanatory statement rate of return guideline, Appendices,* December 2013, Table I.4, pp. 185–186.

submissions. At the conclusion of the Better Regulation program we undertook an evaluation of the consumer reference group. A copy of this evaluation is on our website.[60]

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 allowed rate of return objective. We developed them to provide stakeholders greater certainty, and a framework, as to how we intend to exercise our regulatory judgement whilst keeping sufficient flexibility to make decisions consistent with changing market conditions.[61]

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. 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 allowed rate of return objective 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

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60 Available at: http://www.aer.gov.au/node/19166.

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

(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.

These criteria are applied 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

Our proposed definition of a benchmark efficient entity is to:

- adopt a single benchmark across gas, electricity, transmission and distribution
- adopt a conceptual definition of a benchmark efficient entity that is 'a pure play, regulated energy network business operating within Australia'.

Our benchmark efficient entity is defined to give effect to the allowed rate of return objective which requires it to have a similar degree of risk as that which applies to the distribution or transmission network service provider in respect of the provision of regulated services.[62] Our benchmark efficient entity includes the following sub components as defined below:[63]

Pure play

A pure play business is one which offers services focused in one industry or product area. In this context, it means that the benchmark efficient entity provides only regulated energy network services.

Regulated

A regulated entity for the purposes of our benchmark is one which is subject to economic regulation (that is, revenue price cap regulation) under the National Electricity Rules and/or the National Gas Rules.

Energy network business

Energy network refers to a gas distribution, gas transmission, electricity distribution or electricity transmission business.

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62 NER, cl. 6.5.2(c).

63 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.

Operating within Australia

A benchmark efficient entity should be 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

The weight we proposed give to the point estimates of the return on equity and the return on debt to derive the overall rate of return using the above WACC formula is based on our gearing ratio point estimate of 60 per cent. We give 60 per cent weight to debt and 40 per cent to equity.[64]

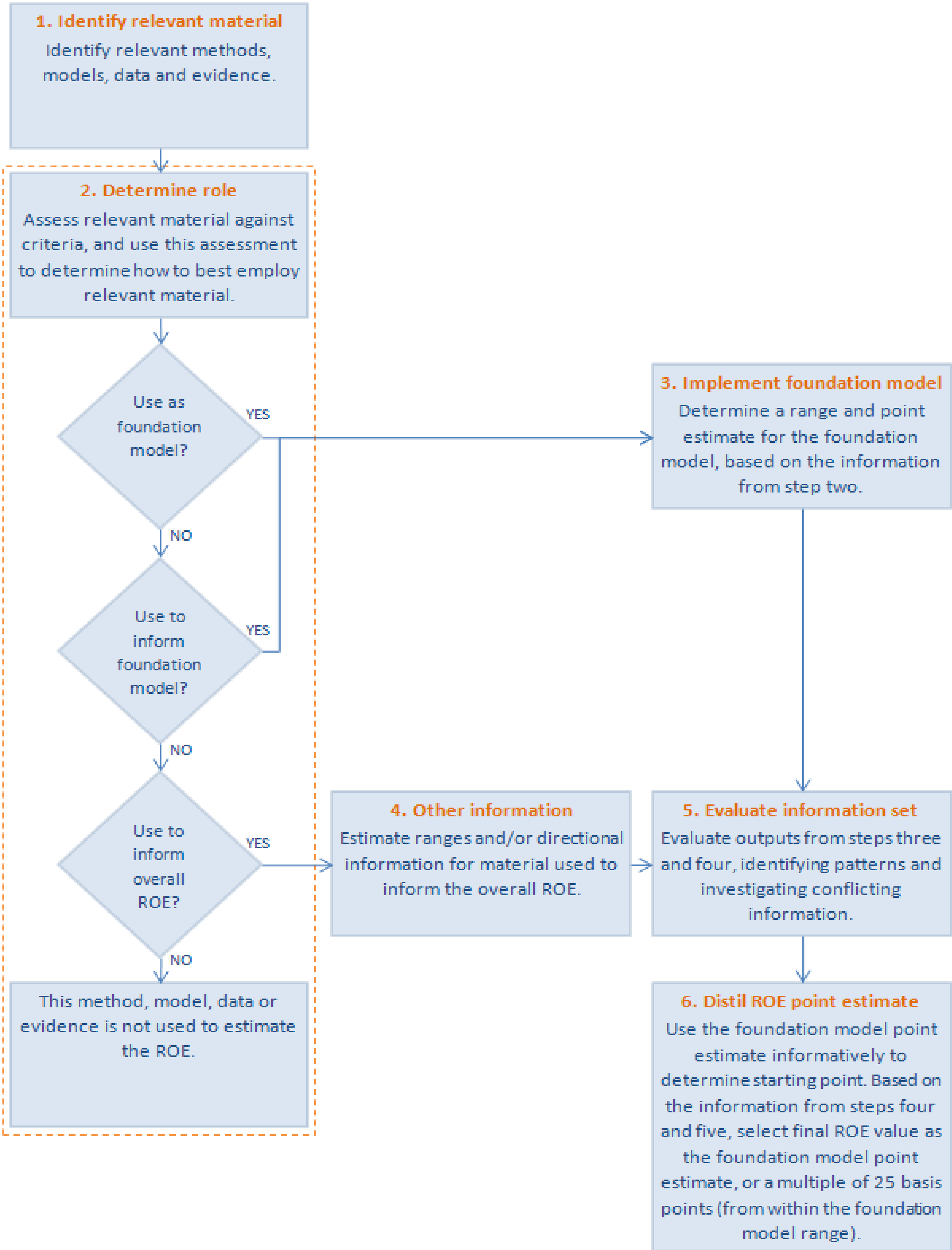
Return on equity

We proposed to estimate the expected return on equity using the six steps set out in the flow chart in Figure 3-1. The reasons for adopting a process that consists of these six steps are discussed in detail in the documents and submissions that make up the material considered during the different stages of developing the Guideline. These include our issues and consultation papers and draft and final explanatory statements.[65]

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

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

Figure 3-1 Flowchart of the AER's proposed approach to estimating the expected return on equity



Return on debt

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

- estimate an on-the-day rate (that is, based on prevailing market conditions) in the first regulatory year (2015-16) of the 2015–20 period, and
- gradually transition this rate into a trailing average approach (that is, a moving historical average) over 10 years.

This gradual transition will occur through updating 10 per cent of the return on debt each year to reflect prevailing market conditions in that year. This approach is consistent with the approached we proposed in the Guideline.

Our preliminary 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 RBA and Bloomberg, adjusted to reflect a 10 year estimate and other adjustments
- 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 rate of return guideline.[66]

Mid period WACC adjustment

We proposed that our overall rate of return estimate will be updated annually because the return on debt is updated annually.[67] Hence, while the return on equity we determine at the start of the regulatory control is fixed for the relevant regulatory period, the return on debt is updated annually to apply our trailing average approach over the regulatory control period.[68] We recently published amendments to the transmission and distribution post tax revenue model (PTRM) to enable the application of the guideline changes.[69]

3.3.3 Interrelationships

This section notes the key interrelationships in the rate of return decision in the context of the rule requirements to apply a rate of return. Where we have had regard to these in developing our approach, they are more fully described in the Guideline. The manner in

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

67 NER, cl. 6.5.2(i).

68 See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013,ch.4.3.2.

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

which these are taken into account in making this decision is set out as part of our reasoning and analysis in section 3.4 and the rate of return appendices.

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 its specific circumstances.[70] 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 costs.[71] The NSP's actual returns could be higher or lower compared to the benchmark 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 allowing NSPs to retain (fund) any additional income (costs) by outperforming (underperforming) the efficient benchmark.[72]

We are mindful that we apply a benchmark approach and an incentive regulatory framework. Any one component or relevant parameter adopted for estimating the rate of return should not be solely viewed 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.

Single benchmark

We adopt a single benchmark efficient entity across all service providers. In deciding on a single benchmark we considered different types of risks and different risk drivers that may have the potential to lead to different risk exposures. We also noted that the rate of return compensates investors only for non–diversifiable risks (systematic risks) and other types of risks are compensated via cash flows and some may not be compensated at all.[73] These interrelationships between the types of risk and the required compensation via the rate of return are an important factor.[74] Our view is that the benchmark efficient entity would face a similar degree of risk 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).

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

71 NEL, s. 7A(2).

72 NEL, s. 7A(3).

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

74 See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013, ch.3.3

Domestic market

We adopt the Australian market as the market within which the benchmark efficient entity operates. 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. This is an important factor in estimating the rate of return and we therefore adopt a domestic approach. Hence, when estimating input parameters for the Sharpe–Lintner capital asset pricing model (SLCAPM) 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. This benchmark gearing level is used:

- to weight the expected required return on debt and equity to derive the overall 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 networks. 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 that the underlying evidence is derived from a sample of regulated network service providers.[75]

Term of the rate of return

We adopt a 10 year term for our overall rate of return.[76] 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.

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[75] See AER, *Better Regulation, Draft Rate of Return Guideline, Explanatory statement*, August 2013, ch.8.34 and appendix C.

[76] See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013, ch.4.3.4.

3.3.4 Expert reports and stakeholder submissions

Expert reports

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

- Professor Michael McKenzie, University of Liverpool.[77]
- Associate professor Graham Partington, University of Sydney.[78]
- Associate professor John Handley, University of Melbourne.[79]
- Dr Martin Lally, Capital Financial Consultants.[80]
- Chairmont, a financial market practitioner[81]

We received advice from Professor Olan Henry, University of Liverpool, on estimating beta. This was commissioned during the Guideline development process and the final report was published in April 2014.[82] We also received advice on return on debt estimation from the ACCC Regulatory Economic Unit (REU).[83] Additionally, we sought and received a substantial amount of expert advice during the Guideline development process including from the REU. These reports have also assisted us in making our preliminary decision.[84]

Stakeholder submissions

We received a large number of submissions which are available on the AER website. Most of these submissions had commentary relating to the rate of return.

3.4 Reasons for preliminary decision

Our allowed rate of return is a weighted average of the return on equity and debt determined on a nominal vanilla basis (i.e. a vanilla WACC). It has been estimated consistently with the estimation of the value of imputation credits.[85] In deriving the WACC, and the estimated efficient debt and equity financing costs, we have applied the benchmark efficient entity

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77 Michael McKenzie and Graham Partington on behalf of the Securities Industry Research Centre of Asia Pacific (SIRCA) Limited, *Report to the AER Part A: Return on Equity*, October 2014.

78 Michael McKenzie and Graham Partington on behalf of the Securities Industry Research Centre of Asia Pacific (SIRCA) Limited, *Report to the AER Part A: Return on Equity*, October 2014 and Graham Partington, *Report to the AER: Return on equity (Updated) April 2015*.

79 John Handley, *Advice on return on equity, Report prepared for the AER*, 16 October 2014; John Handley, *Report prepared for the Australian Energy Regulator: Advice on the value of imputation credits*, 29 September 2014; John Handley, Further *advice on return on equity, April* 2015

80 Martin Lally, *Transitional arrangements for the cost of debt*, November 2014; Martin Lally, *Implementation issues with the cost of debt*, November 2014.;Martin Lally, Review of submissions on the cost of debt, April 2015

81 Chairmont, Cost of debt: Transitional analysis, April 2015

82 Olan Henry, *Estimating β: An update*, April 2014.

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

84 The full list of expert reports are listed and available at http://www.aer.gov.au/node/18859

85 NER, cl. 6.5.2(d).

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.[86]

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 sets out the gearing ratio and our expected inflation rate for the 2014–19 period.

3.4.1 Return on equity

Our reasons in this attachment should be considered in conjunction with the detailed discussions and response to submissions more fully set out in the relevant appendices.[87] We also had regard to the material we considered in making the final decisions that are being published concurrently with this preliminary decision.[88] However, while we had regard to all of this material, given the volume, we have necessarily had to focus our reasons more judiciously. As a result, these reasons do not include detailed discussion on material and issues that we have addressed previously. Also, unless we have explicitly moved away from the Guideline reasoning and findings and/or our November 2014 draft decisions on a particular issue, our considerations in the guideline and draft decisions are relevant to this preliminary decision.[89]

The remainder of this sub section is in two parts. The first is a high level summary and thereafter we set out our reasons following the six step process to estimating the return on equity.

Summary

This summary follows the structure of the attachment, which in turn follows the six steps set out in the Guideline to determine the return on equity.

Step one and two: identify relevant material and role

We had regard to a large amount of material including estimation methods, financial models, market data and other evidence and determined the role we consider that each piece of material should play in estimating the return on equity. This section sets out the way in which the information is used either as the foundation model, to inform our foundation model input

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

87 We had regard to more than 5000 pages of material submitted by service providers with their original return on equity proposals in making our November 2104 draft decisions (see draft decision Rate of return attachment, appendix F).

88 See: Appendix F, Return on equity material.

89 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.

parameters or as other information — other than as the foundation model, to inform our return on equity estimate.[90]

Equity models

We are satisfied that the SLCAPM model is the current standard asset pricing model of modern finance both in theory and in practice. It has been in use for a long period to estimate expected equity returns and transparently presents the key risk and reward trade-off (systematic risk priced via expected returns on equity) that is at the heart of our task. It has wide acceptance and is consistent with the approach employed by financial market practitioners. We consider that applying the SLCAPM as the foundation model in our foundation model approach would lead to an expected return on equity that contributes to the achievement of the allowed rate of return objective. At present, we consider it is superior to all other models that service providers suggested for estimating the expected return on equity by reference to the benchmark efficient entity. We therefore employ the SLCAPM as our foundation model.

We are not satisfied that other equity models submitted to us and the proposed methods for weighting these models better contributes to the achievement of the allowed rate of return objective.[91] We recognise that Energex's application of the SLCAPM entails backwards engineering the equity beta to provide the same return on equity estimate as under the multi-model approach.[92] To this extent, it is a multi-model approach. Our view is that the returns on equity ranges derived from these models do not necessarily assist us to perform our task. Our task is to estimate an expected return on equity commensurate with the risks of a benchmark efficient entity in providing regulated network services. A number of the other models proposed appear to be more focussed on the tasks of identifying relationships that may explain past stock outcomes, rather than estimating an expected return on equity commensurate with the risks of a benchmark efficient entity in providing regulated network services and achieving the allowed rate of return objective.[93]

We use the theory behind the Black CAPM for informing the equity beta to be used in the foundation model and the dividend growth model (DGM) is used for informing the MRP. We also use the Wright approach for informing the overall return on equity. We do not rely on the Fama French three factor model (FFM) to determine the return on equity.

[90] Reasons for why we do not give some information any role are discussed throughout this attachment and relevant appendices.

[91] We are concurrently assessing revised regulatory proposals from eight different service providers and initial regulatory proposals from three service providers. These different adaptations are also taken into account.

[92] See Energex, *Regulatory proposal*, October 2014, p. 165. Energex based this on SFG, *Estimating the required return on equity: Report for Energex*, August 2014, p. 88. Other service providers have proposed this as an alternative approach, designed to give the same result as the multi-model approach. See SFG, *The required return on equity for regulated gas and electricity network businesses: Report for JGN, ActewAGL, Ergon and Transend*, May 2014, p. 11.

[93] John C Handley, *Advice on return on equity, Report prepared for the AER*, 16 October 2014, p. 5.

Foundation model input parameters

We are satisfied that yields on Commonwealth government securities (CGS) with a 10 year term are a widely accepted proxy for the risk free rate and their use will contribute to the achievement of the allowed rate of return objective. We therefore use this information to estimate the risk free rate.

The market risk premium (MRP) cannot be directly observed. Therefore considering a range of conceptual and empirical evidence allows us to determine a point estimate which has regard to prevailing conditions in the market for equity funds and contributes to the achievement of the allowed rate of return objective.[94] The following evidence plays a role in estimating the MRP: historical excess returns, DGM estimates (from our preferred construction of the DGM), survey evidence, conditioning variables and recent decisions by Australian regulators. There is no consensus amongst experts on which method produces the best estimate of the MRP.[95] Estimates of the MRP are diverse and can vary over time.[96]

We have estimated the equity beta for our benchmark efficient by reviewing a broad range of information. We have defined a benchmark efficient entity as a pure play regulated energy network business operating within Australia. Therefore, we rely mostly on empirical equity beta estimates based on Australian energy network firms. We also give a role to conceptual analysis of a benchmark efficient entity's systematic risks relative to the market average. We have also considered international empirical estimates and the theory of the Black CAPM but consider that these sources of information are less suited to our task.

Other information

There are a number of other information classes that can inform our return on equity point estimate, either as a directional or relative indicator. We consider return on equity estimates derived from the Wright approach and other sources (independent valuation reports, brokers and other regulators), as well as return on debt, as directional information.

Step three: implementing the foundation model

We are satisfied, based on the material considered and evaluated by us under steps one and two, that the SLCPAM should be our foundation model. We implement this model using input parameter point estimates which are determined after considering the merits of a broad range of material.

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94 NER, cll. 6.5.2(f–g); NER, cll. 6A.6.2(f–g); NGR, rr. 87(6–7).

95 See Damodaran, *Equity risk premiums: Determinants, estimation and implications— the 2012 edition*, March 2012, p. 93. He also noted: 'No matter what the premium used by an analyst, whether it be 3% or 12%, there is back-up evidence offered that the premium is appropriate'.

96 McKenzie and Partington, *Review of the AER's overall approach to the risk free rate and market risk premium*, February 2013, p. 20; Lally, *Review of the AER's methodology for the risk free rate and the market risk premium*, March 2013, pp. 14–15, 27–34.

Risk free rate

We have used a risk free rate of 2.55 per cent in this preliminary decision. This risk free rate is based on a 20 business day averaging period, from 9 February 2015 to 6 March 2015.

For the substitute determination and true up, we will adopt a risk free rate based on an averaging period that we and Energex have agreed upon.[97] Consistent with our practice, we will keep the dates of averaging periods confidential until they have expired. We are satisfied that the averaging period we have agreed upon provides for a risk free rate that will inform a return on equity that contributes to the achievement of the allowed rate of return objective. This will provide for a forward looking risk free rate commensurate with prevailing conditions in the market for funds at the commencement of the regulatory control period.[98]

MRP

Our point estimate of the MRP for this preliminary decision is 6.5 per cent. We consider a range of 5.1 to 8.6 per cent for the MRP under current market conditions, based on the material before us to inform our decision. The geometric average of historical excess returns currently provides the lowest estimate of the MRP with a range of 3.9 to 4.9 per cent. We consider a reasonable estimate of the lower bound will be above the geometric average.[99] Therefore, our lower bound is above this range. The highest estimate of the MRP is 8.6 per cent.[100] This is an estimate based on our construction of the DGM, using the upper bound of our long term dividend growth rate scenarios. We apply this as the upper bound for the range. We note that the upper bound of the MRP range has increased by 80 basis points since the November 2014 draft decisions. This increase is wholly the result of increased DGM estimates of the MRP.

We derive our point estimate from within this range by considering all of the information that we determine should play a role. The application of our approach can be set out as follows:

- Historical excess returns provide our baseline estimate and indicate an MRP of approximately 6.0 per cent from a range of 5.1 to 6.5 per cent.
- DGM estimates indicate an MRP estimate above this baseline with a range of 7.4 to 8.6 per cent.
- Survey evidence and conditioning variables support an MRP estimate at the baseline of 6.0 per cent. Other regulators' estimates are used as a cross check and indicate an MRP estimate of around 6.5 is reasonable.

Based on our assessment of this information, we are satisfied that an MRP point estimate of 6.5 per cent reasonably reflects prevailing conditions in the market for equity funds and

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97 General Manager – AER Networks, *Rate of return averaging period for the 2015–20 regulatory control period*, 21 January 2015 (Confidential); Group Manager Regulation and Pricing (Energex), Letter: *Rate of return averaging periods*, 29 January 2015.

98 AER, *Explanatory statement rate of return guideline*, 17 December 2013, p. 74.

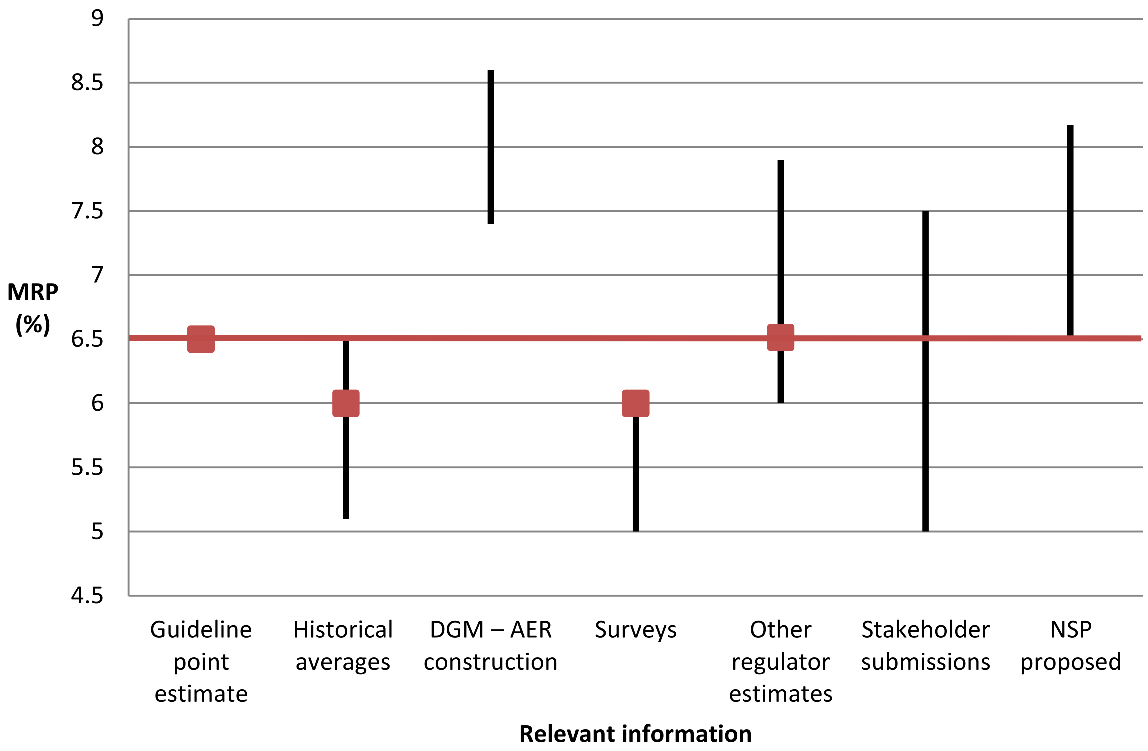
99 AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, p. 83; AER, *Draft decision: SPI Networks access arrangemen*t, September 2012, Appendix B.2.1.

100 The averaging period for this estimate is January–February 2015.

contributes to the achievement of the allowed rate of return objective.[101] This point estimate is at the top of the range implied by historical excess returns. It also provides a balanced outcome given the submissions by service providers and other stakeholders. While DGM estimates of the MRP have increased since the November 2014 draft decisions, other information before us is indicating either no change or an easing in the MRP. We have carefully reviewed this conflicting evidence in the context of achieving the allowed rate of return objective and the prevailing conditions in the market for equity funds. We are satisfied that an MRP of 6.5 per cent is reflective of prevailing conditions in the market for equity funds.[102] We maintain our view that, at this time, evidence form DGM estimates warrant the use of an MRP estimate towards the top of the range implied by historical excess returns estimates.

Figure 3-2 shows the estimates of the MRP using historical excess returns, DGMs, surveys, other regulators' decisions and submissions by service providers and other stakeholders. The squares represent point estimates, the vertical lines represent ranges and the red horizontal line represents our point estimate of 6.5 per cent.[103]

Figure 3-2 Empirical estimates of the MRP (per cent)



Source: AER analysis

[101] NER, cll. 6.5.2(f–g); NER, cll. 6A.6.2(f–g); NGR, rr. 87(6–7).

[102] This view is reinforced by the analysis of other information under step 5 our foundation model approach.

[103] See appendix C–MRP for more information on these sources of information, and the ranges and point estimates we consider are consistent with these sources of information.

Note: The average of each state regulator's most recent decision/update on the MRP forms the point estimate (6.5 per cent) for other regulator estimates. In November 2014, the ERA released a revised draft decision of the WACC for regulated rail networks, which adopted an MRP of 7.9 per cent.[104] This forms the top of the other regulator estimates range. The bottom of this range is 6.0 per cent—the latest estimate of the MRP applied by the ESCV, ESCOSA, NTUC and TER.[105] The stakeholder 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 NSPs. The bottom and top of the stakeholder range comes from the CCP and Chamber of Commerce and Industry Queensland (CCIQ) respectively.[106] The bottom of the NSP range comes from TasNetworks and Directlink's revised proposals which accept the Guideline approach and our draft decisions.[107] The top of the NSP range comes from Jemena Gas Networks' (JGNs') revised proposal, which applies an MRP of 8.17 per cent.[108]

Equity beta

Our point estimate of the equity beta for this decision is 0.7. We estimate the range for the equity beta based on empirical analysis of Australian energy network firms. We consider a number of empirical studies including Professor Olan Henry's (Henry's) 2014 report. The empirical estimates from this analysis are consistent with a range of 0.4 to 0.7.[109] We consider the latest empirical study by Professor Henry to be robust. The consistency of Henry's latest report with previous studies gives us confidence in placing more reliance on this empirical evidence.

In informing the equity beta point estimate (from within the empirical range), we consider evidence from other relevant material. This includes international empirical estimates (set out in section D.3 of appendix D–equity beta) and the theoretical underpinnings of the Black CAPM. This other information does not specifically indicate which equity beta estimate we should choose from within our range. However, for reasons discussed in section D.5.2 of appendix D–equity beta, we consider a point estimate of 0.7 is reasonably consistent with these sources of information and is a modest step down from our previous regulatory

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104 ERA, *Review of the method for estimating the weighted average cost of capital for the regulated railway networks—Revised draft decision*, 28 November 2014, p. 98.

105 ESCV, *Proposed approach to Melbourne Water's 2016 water price review—Consultation paper*, February 2015, p. 39; TER *Draft report: 2015 price determination investigation—Regulated water and sewerage services*, January 2015, p. 41; NTUC, *Network price determination, Part A—Statement of reasons*, April 2014, p. 125; ESCOSA, *SA Water's water and sewerage revenues 2013/14–2015/16: Final determination—Statement of reasons*, May 2013, p. 136.

106 The CCP submitted we should use an MRP of 5.0 per cent and the CCIQ submitted that we should select an MRP point estimate from a range of 5.0–7.5 per cent. CCP, *Response to AER draft determination for TasNetworks and TasNetworks' revised revenue proposal*, 18 February 2015, p. 4; CCP, *Response to AER draft determination for TransGrid and TransGrid's revised revenue proposal*, 16 February 2015, p. 7; CCP, *Submission: AER draft TransGrid determination TransGrid revised revenue proposal*, 6 February 2015, p. 13; CCP, *Response to AER draft determination for re: ActewAGL regulatory proposal 2014–19*, February 2015, p. 24; CCP, *Submission to AER: Responding to NSW draft determinations and revised proposals from electricity distribution networks*, 2 January 2015, p. 46; CCIQ, *Submission to Energex's regulatory proposal for 2015–20*, 30 January 2015, p. 16; CCIQ, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 20.

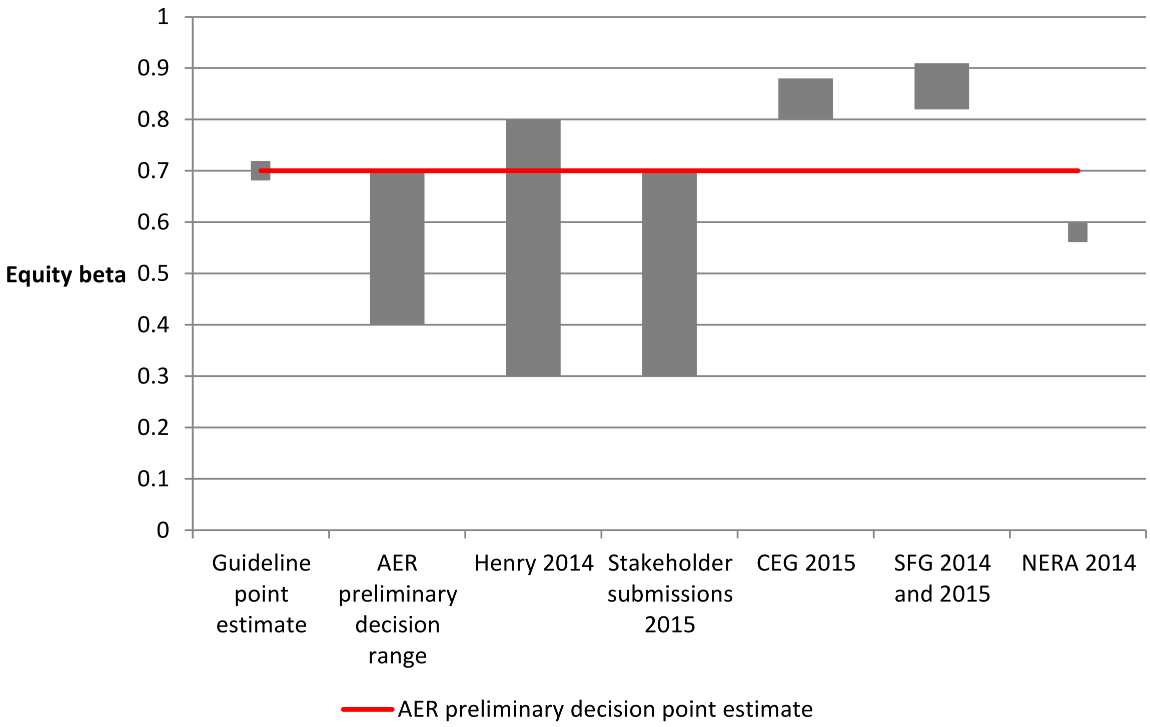
107 TasNetworks, *Revised revenue proposal*, January 2015, p. 5. Directlink, *Revised revenue proposal*, January 2015, p. 11.

108 JGN, *Revised access arrangement proposal*, February 2015, pp. 30–31.

109 Henry, *Estimating β: An update*, April 2014. We also consider Australian empirical estimates from other studies by Henry, the ERA, ACG, SFG and Grant Samuel and Associates Ltd.

determinations.[110] Choosing a point estimate at the upper end of our range also recognises the uncertainty inherent in estimating unobservable parameters, such as the equity beta. Many stakeholders have submitted that we should choose an equity beta lower than 0.7, while service providers have submitted we should choose a higher value. At this time, we do not consider the evidence is indicating a case for choosing a value other than 0.7. In addition, the importance that all stakeholders place on certainty and predictability suggest to us that a departure from the guideline is unlikely to better contribute to the achievement of the allowed rate of return objective at this time.[111] Figure 3-3 shows our equity beta point estimate and range for the benchmark efficient entity compared to other submissions.

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



Source: AER analysis[112]

[110] Since 2010, all our regulatory determinations have applied an equity beta of 0.8. See: AER, *Final decision: Review of the WACC parameters*, May 2009, p. v.

[111] See discussion under step three in this section.

[112] 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; Alliance of Electricity Consumers, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 6; Origin, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 17; Origin, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2015, p. 13; Origin, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 15; NERA, *Return on capital of a regulated electricity network*, May 2014, p. 79; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 57–58. SFG submitted 0.82 (under multiple model approach for return on equity) in SFG, *Equity beta*, May 2014, p. 41; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 28; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 85; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 20; SFG, *The required return on equity for the benchmark efficient entity*,

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 Alliance of Electricity Consumers' submission and the upper bound is based on Origin's submissions. The CEG 2015 range is based on adjustments to SFG's regression based estimates for the mining boom. The SFG 2014 and 2015 range lower bound is based on SFG'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's multiple model based equity beta estimates (under its alternative 'foundation model' approaches for the return on equity). The NERA 2014 point estimate is based on an equity beta of 0.58, which NERA used for its preferred specification of the SLCAPM (although NERA uses multiple models to estimate the return on equity).

Step four: other information

Under steps one and two we considered the available information and determined its role. Under step four we estimate the values we derive from this other information. We consider that, on the whole, this other information broadly supports our foundation model estimate of the return on equity. The critical allowance for an equity investor in a benchmark efficient entity is the allowed equity risk premium over and above the estimated risk free rate at a given time.[113] Under the standard application of the SLCAPM, this equals the MRP multiplied by the equity beta. Hence, we have compared equity risk premium estimates where appropriate. Our analysis shows that:

- The Wright approach to specifying the CAPM results in an equity risk premium range of 3.0 to 7.1 per cent. This equates to a return on equity range of 5.5 to 9.7 per cent with a prevailing risk free rate.
- Equity risk premium estimates from other market participants (independent valuers, brokers, and other regulators) for comparable firms range from 2.6 to 12.3 per cent. This equates to a return on equity range of 6.9 to 15.6 per cent with the prevailing risk free rate.
- Our foundation model return on equity estimate is about 260 basis points above the prevailing return on debt. This reflects the difference between our equity risk premium of 4.55 per cent and the debt risk premium on 10 year BBB bonds of approximately 190 basis points.[114]

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12 March 2015, p. 20; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 4. SFG submitted 0.91 (under alternative 'foundation model' approaches for return on equity) in SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 96; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 88; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 35.

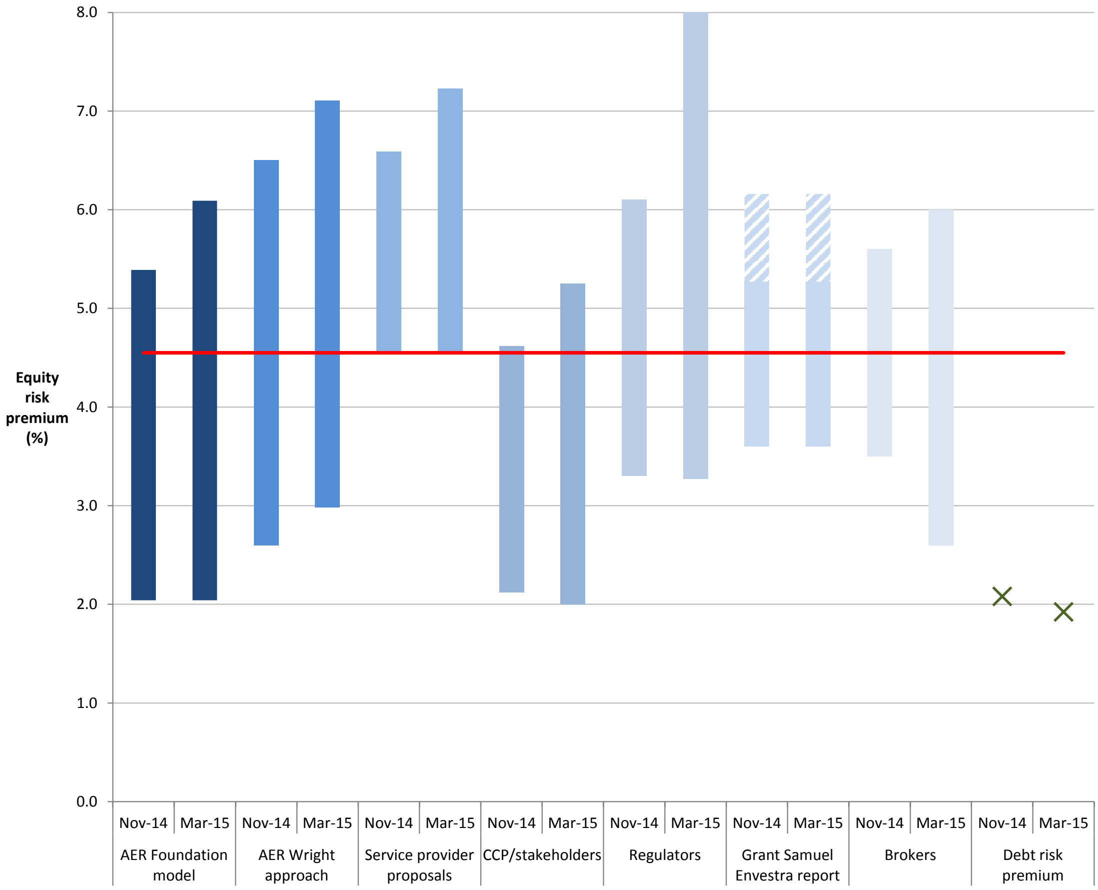
113 Our task is to determine the efficient financing costs commensurate with the risk of providing regulated network service by an efficient benchmark entity (allowed rate of return objective). Risks in this context are those which are compensated via the return on equity (systematic risks).

114 To calculate this, we use the RBA's published spread to CGS on 10 year BBB non-financial corporate bonds (as at the end of February 2015). This is not reflective of our preliminary decision return on debt estimate which is calculated as an average of the RBA and Bloomberg (BVAL) data series. In our preliminary decision we also make an extrapolation adjustment to the RBA data series.

Step 5: Evaluation of information set

Adopting our input parameter point estimates results in an allowed equity risk premium of 4.55 per cent. This falls within the range of most other indicators available to inform the return on equity. The comparison of other information with our SLCAPM estimate is shown in Figure 3-4.

Figure 3-4 Other information comparisons with the AER allowed 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 MRP and equity beta as set out in step three. The calculation of the Wright approach, debt premium, brokers, and other regulators ranges is outlined in Appendices E.1, E.2, E.4, and E.5 respectively.

Grant Samuel's final WACC range included an uplift above an initial SLCAPM range. The lower bound of the Grant Samuel range shown above excludes the uplift while the upper bound includes the uplift and is on the basis that it is an uplift to return on equity. Grant Samuel made no explicit allowance for the impact of Australia's dividend imputation system. We are uncertain as to the extent of any dividend imputation adjustment that should be applied to estimates from other market practitioners. Accordingly, the upper bound of the range shown above includes 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.[115]

The service provider proposals range is based on the proposals from businesses for which we are making final or preliminary decisions in April–May 2015.[116] Equity risk premiums were calculated as the proposed return on equity less the risk free rate utilised in the service provider's proposed estimation approach.

The CCP/stakeholder range is based on submissions made (not including service providers) in relation to our final or preliminary decisions in April–May 2015. The lower bound is based on the Energy Users Association of Australia submission on NSW distributors' revised proposals. The upper bound is based on Origin's submission on ActewAGL's proposal.[117]

In coming to our decision on the allowed return on equity the key influential factors are:

- The other information we examined does not support the view that risk premiums have increased since our November 2014 draft decisions and we do not consider that there is sufficient evidence to cause us to move away from our foundation model estimate. Having considered the overall information and material before us, at this time we are not satisfied that this new information indicates a departure from our November 2014 draft decisions or from the guideline would contribute to the achievement of the allowed rate of return objective. We think the importance placed by all stakeholders on predictability and certainty of the guideline is important to contribute to the achievement of the allowed rate of return objective.[118]
- Our foundation model return on equity estimate is about 260 basis points above the prevailing return on debt. The return on debt is a relative indicator and we expect that most of the time investors' expected return on equity will exceed the expected return on debt. For our benchmark efficient entity with a similar degree of risk as Energex, we would not expect the return on equity to be a large margin above the prevailing return on debt because of the low risk profile of the benchmark efficient entity.[119] The return on debt material does not support any change to our foundation model return on equity estimate.
- The regulatory regime to date has been supportive of investment. The NSPs we regulate have been able to raise capital to undertake extensive investment programs.[120] This suggests the allowances set in the past were at least adequate to recover efficient costs. The return on equity we have determined in this decision is broadly in line with past

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

116 ActewAGL, Ausgrid, Directlink, Endeavour Energy, Energex, Ergon Energy, Essential Energy, Jemena Gas Networks, SA Power Networks, TasNetworks, and TransGrid.

117 Energy Users Association of Australia, *Submission to NSW DNSP Revised Revenue Proposal to AER Draft Determination (2014 to 2019)*, February 2015, pp. 15–16; Origin Energy, *Submission to ActewAGL's regulatory proposal for 2014–19*, August 2014, p. 4.

118 See Section 3.4.1–Step Five for more detail.

119 Due to the regulatory regime and the businesses' monopoly positions shielding them from systematic risk; as well as the measured debt yields likely understating the expected return due to default risk. For more information, see our discussion under step two.

120 Since 2008, the transmission and distribution NSPs across the national electricity market have invested in the order of $6 billion per year in capital expenditure (capex).This is a high level conservative estimate that does not include the gas networks that we regulate.

decisions, albeit lower. This provides confidence that our estimate for this preliminary decision, while taking account of more recent information on the equity beta and current market conditions, is likely to provide Energex with a reasonable opportunity to recover at least efficient costs.[121]

Step six: distil point estimate

We are satisfied that an expected return on equity derived from the SLCAPM should be the starting point for estimating the return on equity. We are also satisfied that the other information does not indicate that our equity risk premium estimate should be uplifted or downshifted to contribute to the achievement of the allowed rate of return objective.

Following our estimation approach and having considered and given the relevant material due weight on their merits, we are satisfied that an expected return on equity estimate of 7.1 per cent derived from our implementation of the SLCAPM will contribute to the achievement of the allowed rate of return objective. We are also satisfied that this estimate is consistent with prevailing market conditions.

Reasons

Step one: identify relevant material

Our identification and assessment of relevant material is discussed under the following sub headings:

- equity models
- risk free rate
- MRP
- equity beta
- other information.

Equity models

We considered all models that have been proposed. In this sense, all of the models are relevant. Detailed consideration of all proposed models is in appendix A—Equity models. While we have considered all proposed models, we are not satisfied that they are all of equal

[121] Our previous decision for Energex in May 2010 adopted an equity risk premium of 6.0 per cent [AER, *Final Decision: Queensland distribution determination 2010–11 to 2014–15*, May 2010]. Our previous Rate of Return Guideline, released in May 2009, adopted an equity risk premium of 5.2 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]. Our most recent final decisions (excluding transitional decisions) for any electricity or gas service provider were in 2013 and adopted an equity risk premium of 5.2 per cent for ElectraNet and 4.8 per cent for Victorian gas network service providers [AER, *Final Decision: ElectraNet Transmission Determination 2013–14 to 2017–18*, 30 April 2013, p. 24; AER, *Access Arrangement Final Decision*, Multinet Gas (DB No. 1) Pty Ltd, Multinet Gas (DB No. 2) Pty Ltd, 2013–17, Part 2: Attachments, 15 March 2013, p. 143.]. This preliminary decision adopts an equity risk premium of 4.55 per cent, which is consistent with our 2013 Rate of Return Guideline.

value. In fact, we consider that the value of the FFM in setting the regulated return on equity is limited to the extent that we decided not to give it a role. As a result of the role we give each model, it has not been necessary to estimate the return on equity derived from each of these models. In some cases, we consider it could be misleading to derive quantitative estimates in view of the limitations of the models and their estimation.

We reviewed all models submitted to us for consideration. This is consistent with our approach at the time of publication of the Guideline, where we had regard to the information on the different models before us. We also have regard to information on these models submitted after we published the Guideline.

We have therefore had regard to the following models:

- the standard Sharpe Lintner Capital Asset Pricing Model (SLCAPM)
- the Fama French Three Factor Model (FFM)
- the Black Capital Asset Pricing Model (Black CAPM)
- the Dividend Growth Model (DGM)
- the non-standard (Wright and historically based) specifications of the SLCAPM.

Under step two, we discuss our assessment of the models against our assessment criteria as part of assessing the role of this information.

Risk free rate

We estimate the risk free rate using yields on Commonwealth government securities (CGS) with a 10 year term. Our assessment of this information against our criteria shows yields on CGS are a reasonable proxy for the risk free rate (Table 3-2). As such, we consider this information produces an estimate of the risk free rate that will contribute to achieving the allowed rate of return objective.

Table 3-2 Assessment of Commonwealth government securities against criteria

Criteria[122]	Commonwealth Government securities
Where applicable, consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data.	The risk free rate measures the return an investor would expect from an asset with no default risk. CGS are low default risk securities issued by the Australian Government, and are an appropriate proxy.[123]
Fit for purpose: The use of estimation methods, financial models, market data and other evidence	Prevailing 10 year CGS yields reflect expectations of the risk free rate over the

[122] We have not included the criterion on quantitative modelling because this does not apply to CGS.

[123] See, for example, Lally, *The present value principle*, March 2013, p. 13, and Wright, *Review of risk free rate and Cost of equity estimates: A comparison of UK approaches with the AER*, October 2012, p. 3.

Criteria[122]	Commonwealth Government securities
should be consistent with the original purpose for which it was compiled and have regard to the limitations of that purpose. We should also promote simple over complex approaches where appropriate.	appropriate forward looking investment horizon (10 years). The yield on CGS is the best proxy for the risk free rate in Australia, as supported by the Reserve Bank of Australia (RBA).[124]
Implemented in accordance with good practice: Supported by robust, transparent and replicable analysis that is derived from available, credible datasets.	Yields on CGS are robust. The RBA, Commonwealth Treasury and Australian Office of Financial Management advised the CGS market is liquid and functioning well.
Where market data and other information is used, this information is credible and verifiable, comparable and timely, and clearly sourced.	The RBA publishes CGS yields, and is a credible institution. This information is also updated daily.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	This information is forward looking, set by the market and updated daily.

MRP

Recognising the MRP cannot be directly observed, we have regard to prevailing conditions in the market for equity funds by considering a range of conceptual and empirical evidence.[125] The material we reviewed includes:

- historical excess returns
- our preferred construction of the DGM[126]
- survey evidence
- conditioning variables (dividend yields, credit spreads, implied volatility)
- other Australian regulators' MRP estimates
- SFG's preferred construction of the DGM
- independent valuation reports
- the Wright approach
- our preferred imputation credit adjustment (Brailsford et al.)
- SFG's preferred imputation credit adjustment (Officer).

We have assessed the relevant material against the rate of return criteria set out in the Guideline. Table 3-3 summarises our assessment of information we use to estimate the

[124] RBA, *Letter to the ACCC: The Commonwealth Government Securities Market*, 16 July 2012, p. 1.
[125] NER, cl. 6.5.2(g); NER, cl. 6A.6.2(g); NGR, r. 87(7).
[126] We use a DGM that is adjusted for the value of imputation credits to inform the MRP.

MRP. In Table 3-10, Table 3-16, Table 3-30 and Table 3-42 we assess the information before us that we do not rely on to inform the MRP.

We consider it is important to have regard to a range of evidence when estimating the MRP. This recognises:

- There is no consensus among experts on which method produces the best estimate of the MRP.[127] This reflects differences in opinion regarding the relative strengths of different estimation methods, and how different estimates should be brought together. We consider these relative strengths and limitations in the Guideline and in our assessment against our criteria (see Table 3-3).[128]
- We must assess a range of evidence and apply judgement to determine a point estimate because estimates of the MRP are diverse and can vary over time.[129] We note there is no consensus among experts on how a point estimate of the MRP should be determined.
- Given the importance of avoiding bias in regulatory outcomes over time, it is important to apply different sources of evidence symmetrically through time.
- Unlike the risk free rate, the evidence on the MRP is comparatively imprecise and subject to varied interpretation. In addition, different methods can produce widely different results at the same point in time.[130]
- Considering a range of information is consistent with the approach used by finance market practitioners.[131]

127 See Damodaran, *Equity risk premiums: Determinants, estimation and implications—the 2012 edition*, March 2012, p. 93. He also noted: 'No matter what the premium used by an analyst, whether it be 3% or 12%, there is back-up evidence offered that the premium is appropriate'.

128 AER, *Explanatory statement: Rate of return guideline*, 17 December 2013, pp. 90–91.

129 McKenzie and Partington, *Review of the AER's overall approach to the risk free rate and market risk premium*, February 2013, p. 20; Lally, *Review of the AER's methodology for the risk free rate and the market risk premium*, March 2013, pp. 14–15, 27–34.

130 Damodaran, *Equity risk premiums: Determinants, estimation and implications—the 2012 edition*, March 2012, p. 93. He also noted: 'No matter what the premium used by an analyst, whether it be 3% or 12%, there is back-up evidence offered that the premium is appropriate'.

131 For example, Grant Samuel initially estimates the return on equity with a Sharpe–Lintner CAPM, using an MRP based on historical excess returns. It then considers a broad range of evidence. This includes market sentiment (including volatility), other risk premiums measures (such as bond premiums), differences between current and historical bond rates, analysts' rate of return estimates and DGMs. See: Grant Samuel, *Cost of equity capital*, 22 May 2014, p. 5.

Table 3-3 Assessment of information on the market risk premium against criteria

Criteria	Historical excess returns	Dividend growth models	Survey evidence	Conditioning variables	Regulatory decisions
Where applicable, reflective of economic and finance principles and market information. Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	Based on empirical analysis. Some experts observe there is no better forecast of expected excess returns than the historical average.[132] There are challenges when selecting the averaging period and a measure of central tendency (arithmetic or geometric averages)	DGMs reflect economic and finance principles. Based on the finance principle that markets are efficient and the present value (that is, market price) of a share reflects the discounted (present) value of its expected future dividends. DGMs make no assumptions on the risk factors that explain the required return on equity.	Lally has supported using survey evidence, but has warned some surveys warrant little consideration.[133]	Academic literature offers some conceptual basis for conditioning variables informing excess returns.[134] Some empirical evidence supports this too.[135] However, there is also scepticism in the academic literature about conditioning variables' ability to predict returns	Rules governing regulatory decisions typically require estimates to be based on well accepted economic and financial principles.
Fit for purpose. The use	Fit for purpose because	While DGMs are used	The MRP is a metric of	There is a body of work	Derived for similar

132 Dimson, Marsh and Staunton, *Credit Suisse Global Investment Returns Sourcebook 2012*, February 2012, p. 37.

133 Lally, *Review of the AER's methodology*, March 2013, p. 32.

134 SFG, *Market risk premium: An updated assessment and the derivation of conditional and unconditional estimates*, February 2012, p. 10; NERA, *Market risk premium for the ENA*, October 2013, pp. 35–36.

135 SFG, *Market risk premium: Report for APT Petroleum Pipelines Ltd*, October 2011, p. 9; Fama and French, Dividend Yields and Expected Stock Returns, 1988, *Journal of Financial Economics*, 25, pp. 23-49.

Criteria	Historical excess returns	Dividend growth models	Survey evidence	Conditioning variables	Regulatory decisions
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. Also, promote simple over complex approaches where appropriate.	this is considered the benchmark method for estimating the MRP in Australia.[136] Historical excess returns can estimate a forward looking MRP on the view that investors base their forward looking expectations on past experience.[137]	to price shares, they can also estimate the MRP. While DGMs are used in the Australian context, their use appears limited compared to the SLCAPM.[138] DGMs can be simple or complex, depending on how they are constructed. Our DGM is relatively simple.	investor expectations. Therefore, it is fit for purpose to estimate the MRP by asking investors what they expect.	which casts doubt on the accuracy of dividend yields as a predictor of excess returns, suggesting this is not fit for purpose.[139] Implied volatility may not provide any new information to what is already contained in DGM estimates.[140]	purposes. However, other regulators may operate under a different framework.
Implemented in accordance with good practice. That is, supported by robust, transparent and	Estimation methods and results are transparent, replicable, extensively studied and well understood. [141]	DGMs rely on market data. Therefore, if the methodology is transparent, it is possible to replicate	Surveys can have significant limitations that can reduce the value of this information.[142]	Some evidence suggests the use of credit spreads is not robust for informing the MRP.[144] It is difficult to	Laws typically require regulatory decisions to be well reasoned and transparent.

136 McKenzie, Partington, *Report to Corrs Chambers Westgarth: Equity market risk premium*, 21 December 2011, pp. 5–6.

137 Australian Competition Tribunal, *Application by DBNGP (WA) Transmission Pty Ltd (No 3) [2012] ACompT 14*, 26 July 2012, paragraph 153.

138 See Table 3-9.

139 See, for example, AER, *Draft decision: Access arrangement draft decision: APA GasNet Australia (Operations) Pty Ltd 2013-17*, September 2012, p. 47.

140 NERA, *Market risk premium for the ENA*, October 2013, pp. 35–36.

141 McKenzie, Partington, *Report to Corrs Chambers Westgarth: Equity market risk premium*, 21 December 2011, pp. 5–6.

Criteria	Historical excess returns	Dividend growth models	Survey evidence	Conditioning variables	Regulatory decisions
replicable analysis that is derived from available credible datasets	While there is a large sample of robust data, there are issues with earlier data. Also, the 'equity premium puzzle' suggests this data may overstate expected returns.	results. The simplicity of our DGM enables it to be estimated in a robust, transparent and replicable manner.	However, these limitations can be mitigated through the triangulation of survey evidence.[143]	convert dividend yields and credit spread into an MRP estimate.[145] It is also difficult to apply implied volatility.[146]	
Where models of the return on equity and debt are used these are based on quantitative modelling which a) is sufficiently robust as to not be unduly sensitive	Not applicable.	DGMs are highly sensitive to assumptions.[147] Results are also sensitive to errors in analyst forecasts. McKenzie and Partington consider	Not applicable.	Not applicable.	Not applicable

142 The Australian Competition Tribunal has identified limitations of this evidence, which we are mindful of. See Australian Competition Tribunal, *Application by Envestra Limited (No 2) [2012] ACompT 3,* 11 January 2012, paragraphs 159–163.

144 See, for example, AER, *Final decision: Access arrangement final decision: APA GasNet Australia (Operations) Pty Ltd 2013-17*, March 2013, Part 3, p. 49.

143 A specific survey might be subject to an unknown bias that is less likely to be consistent across surveys using different methods and different target populations McKenzie and Partington, *Supplementary report on the MRP*, February 2012, p. 19; McKenzie and Partington, *MRP: regime switching framework and survey evidence*, August 2012, p. 28.

145 SFG, *Market risk premium: Report for APT Petroleum Pipelines Ltd*, October 2011, p. 9; McKenzie and Partington, *Supplementary report on the MRP*, February 2012, p. 23.

146 We considered implementation issues in AER, *Final decision: Access arrangement final decision: SPI Networks (Gas) Pty Ltd 2013-17*, March 2013, Part 2, pp. 103–105.

147 This includes assumptions about the long term dividend growth rate and the length of transition to long term growth. McKenzie, Partington, *Equity market risk premium*, December 2011, p. 25; AER, *Final decision: APA GasNet*, March 2013, p. 101.

Criteria	Historical excess returns	Dividend growth models	Survey evidence	Conditioning variables	Regulatory decisions
to errors in inputs estimation, b) avoids arbitrary filtering or adjustment of data, which does not have a sound rationale.		our DGM is likely to produce upward biased estimates.[148]			
Where market data and other information is used, this information is credible and verifiable, comparable and timely and clearly sourced	Credible and verifiable as historical excess returns can be directly measured. Timely, as this can be updated daily. This information is publicly available. Studies on historical excess returns are clearly sourced.[149]	Uses market data that are timely, well sourced and verifiable. However, evidence suggests analyst forecasts are sluggish and overly optimistic.[150]	Survey design and the representativeness of respondents are important and may be unknown.	Conditioning variables all rely on market data that is credible, verifiable, comparable, timely and clearly sourced.	We can only consider market data indirectly through this information.
Sufficiently flexible as to	Responds slowly to	Theoretically, readily	While results vary little	Conditioning variables	May not reflect

148 They consider this is due to factors such as optimistic analyst dividend forecasts, stickiness with dividends and the practice of financing dividends. They also consider our estimate of the long term dividend growth rate is 'on the high side'. See: McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 26, 28–30, 34; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 46–50, 53, 59.

149 See, for example, Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008.

150 McKenzie, Partington, *The DGM*, December 2013, p. 8; McKenzie, 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.

Criteria	Historical excess returns	Dividend growth models	Survey evidence	Conditioning variables	Regulatory decisions
allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	changes in market conditions.	reflects changes in the market data as it reflects changes in dividend forecasts and share prices. However, in practice, DGMs may not track these changes accurately.[151] DGMs can also generate volatile and conflicting results.[152]	across time, this likely reflects investor expectations as surveys are forward looking. However, survey results may not be timely.	change daily, are readily observable and may offer information about changes in the MRP.	prevailing market conditions, given delays from when decisions are made.

[151] This is due to factors such as sluggish (and optimistic) analyst dividend forecasts, stickiness with dividends and the practice of financing dividends. See: 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.

[152] Different consultants have produced widely different DGM estimates over short periods, From March 2012–2013, we received DGM estimates of the MRP ranging from 5.90–9.56 per cent. See AER, *Final decision: Access arrangement final decision: SPI Networks (Gas) Pty Ltd 2013-17*, March 2013, Part 2, pp. 101–103, Part 3, 50–56.

Equity beta

Recognising that the equity beta cannot be directly observed, we have regard to prevailing conditions in the market for equity funds by considering a range of relevant material.[153] The material we reviewed includes:

- conceptual assessment of the overall systematic risk of the benchmark efficient entity relative to the market average firm (conceptual analysis)
- empirical equity beta estimates based on a comparator set of Australian energy network firms (Australian empirical estimates)
- empirical equity beta estimates based on a comparator set of international energy network firms (international empirical estimates)
- evidence from the Black CAPM:
    - empirical results
    - theoretical principles
- empirical evidence from SFG's DGM construction
- empirical evidence from the Fama French three factor model (FFM).

We have assessed the relevant material against the rate of return criteria set out in the Guideline. Table 3-4 summarises our assessment of conceptual analysis, Australian empirical estimates, international empirical estimates and evidence from the Black CAPM. Table 3-7 and Table 3-30 set out our assessment of the FFM and SFG's DGM construction, respectively.

[153] NER, cl. 6.5.2(g); NER, cl. 6A.6.2(g); NGR, r. 87(7).

Table 3-4 Assessment of information on the equity beta against criteria

Criterion	Conceptual analysis	Australian empirical estimates	International empirical estimates	Evidence from the Black CAPM [(a)]
Where applicable, reflective of economic and finance principles and market information. Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data.	Conceptual analysis is grounded in economic and finance theory.	Australian empirical estimates are based on the available market data. Sound econometric techniques were used to derive these estimates.	Like domestic empirical estimates, international estimates are based on the available market data and employ sound econometric techniques. They may be more statistically precise than domestic estimates if they are generated from larger datasets.	Theoretical principles underpinning the Black CAPM are grounded in economic theory. However, the empirical analysis is not sound, since there is an unresolved inconsistency between the zero beta return estimate and the model restrictions.
Fit for purpose. 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. Also, promote simple over complex	Conceptual analysis assesses the differences between the benchmark efficient entity and the market average. It is reasonable to use conceptual analysis to inform the equity beta of a benchmark efficient entity.	There are no businesses which precisely meet our definition of the benchmark efficient entity.[154] Therefore, it is reasonable to use market data for domestic businesses that are considered to be close comparators to the benchmark efficient entity to	International equity beta estimates do not meet our benchmark efficient entity definition. The use of a foreign proxy is a suboptimal outcome that can only be justified where there is evidence that this will produce superior estimates of the domestic equity beta	We are estimating the equity beta for the SLCAPM. Given the limitations that we have identified for the Black CAPM, it is unreasonable to estimate the Black CAPM equity beta equivalent. We only use its theoretical principles to help guide our

[154] AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 8, 33–36, 44–45.

Criterion	Conceptual analysis	Australian empirical estimates	International empirical estimates	Evidence from the Black CAPM [(a)]
approaches where appropriate.		inform the equity beta estimate.	than the Australian estimates.	selection.
Implemented in accordance with good practice. That is, supported by robust, transparent and replicable analysis that is derived from available credible datasets.	We commissioned Frontier Economics to review the risks faced by regulated energy networks in Australia and McKenzie and Partington to undertake the conceptual assessment.	Australian empirical estimates are derived from robust, transparent and replicable regression analysis performed by an expert in econometrics, Professor Olan Henry. Different studies with different econometric techniques and different sampling periods provide consistent results.	Countries differ along a number of dimensions. If foreign comparators were to be used to determine the equity beta estimate for the benchmark efficient entity, it would be reasonable to quantify the impacts of these differences and to make necessary adjustments. However, it is difficult to make such adjustments in a robust and transparent manner.	There is no generally accepted method to generate a reliable estimate of the zero beta return. The theory of the Black CAPM can only provide limited information in informing the equity beta, and cannot be used (in accordance with good practice) to apply a specific adjustment to the equity beta.[155]
Where models of the return on equity and debt are used these are based on quantitative modelling which a) is sufficiently robust as to not be unduly sensitive to	Not applicable	Not applicable	Not applicable	The Black CAPM is sensitive to errors in the estimation of the zero beta return. Not applicable for theoretical principles.

155 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.

Criterion	Conceptual analysis	Australian empirical estimates	International empirical estimates	Evidence from the Black CAPM [(a)]
errors in inputs estimation, b) avoids arbitrary filtering or adjustment of data, which does not have a sound rationale.				
Where market data and other information is used, this information is credible and verifiable; comparable and timely; and clearly sourced.	Not applicable	Market data used for Australian empirical estimation meets this criterion.	Market data used for international empirical estimation meets this criterion.	Not applicable
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	Not applicable	We can update the empirical estimates to take into account the latest available market data.	We can update the empirical estimates to take into account the latest available market data	While the theory of the Black CAPM should allow the model to accommodate changing market conditions, the difficulties in estimating the zero beta return are magnified when attempting to match current market conditions (instead of an average figure over many years).

(a) See Table 3-8 for a more detailed assessment of the empirical implementation of the Black CAPM against the criteria set out in the Guideline. Also see step two of our foundation model approach and appendix A–equity models for detailed discussion of the limitations associated with the empirical implementation of the Black CAPM.

Other information

In addition to equity models and their parameters, we have had regard to the other information that the Guideline stated would be relevant material. We also have had regard to additional material that stakeholders submit should be treated as relevant. A number of stakeholders submitted that we should consider material on realised returns to equity from asset sales and NSPs' financial statements.[156] We have had regard to the following other information:

- return on debt relative to the return on equity
- return on equity estimates from:
  - independent valuation (expert) reports
  - broker reports
  - other regulators' decisions
- realised return on equity estimates calculated from:
  - asset sales (transaction multiples)
  - NSP financial statements.

In the case of this other information we have discussed the assessment of the material against our criteria in step two.

Step two: determine role

The role allocated to each piece of relevant material is discussed under the following sub headings:

- equity models
- risk free rate

[156] CCP, *Smelling the roses and escaping the rabbit holes: The value of looking at actual outcomes in deciding WACC—Prepared for the Board of the Australian Energy Regulator*, July 2014. CCP, *Response to AER Draft Determination Re: ActewAGL Regulatory Proposal 2014–19*, February 2015, p. 24. Major Energy Users, *Australian Energy Regulator - Tasmanian Electricity Transmission Revenue Reset - AER Draft Decision and TasNetworks Revised Proposal - A response by Major Energy Users Inc*, February 2015, pp. 55–56. Energy Markets Reform Forum, *Australian Energy Regulator - NSW Electricity Distribution Revenue Reset - AER Draft Decision and Revised Proposals from Ausgrid, Endeavour Energy, and Essential Energy, A response by EMRF*, February 2015, pp. 34–35. Energy Users Association of Australia, *Submission to NSW DNSP revised revenue proposal to AER draft determination (2014 to 2019)*, February 2015, pp. 11, 14. Public Interest Advocacy Centre, *A Missed Opportunity?* Submission to the Australian Energy Regulator's Draft Determination for Ausgrid, Endeavour Energy, and Essential Energy, February 2015, p. 36. Energy Users Association of Australia, *Submission to SA Power Networks Revenue Proposal (2015 to 2020)*, January 2015, p. 14. Energy Users Association of Australia, *Submission to Energex Revenue Proposal (2015/16 to 2019/20)*, January 2015, p. 13. Energy Users Association of Australia, *Submission to Ergon Energy (Ergon) Revenue Proposal (2015/16 to 2019/20)*, January 2015, p. 13. Queensland Resources Council, *Ergon Energy Determination 2015–2020*, January 2015, p. 7. Tasmanian Minerals and Energy Council, *TasNetworks Transmission Revenue Proposal 1 July 2014 - 30 June 2019*, February 2015, p. 2.

- MRP
- equity beta
- other information.

After assessing the relative merits of each piece of relevant material, we have decided to use the foundation model approach. Under this approach we have given the SLCAPM the role of foundation model, and other information is used to inform the selection of parameters to the SLCAPM or to inform the overall return on equity relative to the foundation model estimate.

Service providers, through several reports by SFG, also submitted that, 'a range of models should be employed – to meet the allowed rate of return objective and to ensure that the estimate best meets the NGO, NEO and RPP'.[157] SFG's claim, as submitted by ActewAGL is based on its 'default starting point'.[158] That is, an assumption that combined evidence of all models is superior. SFG submitted that it is impossible to identify one superior model.[159] We consider that the allowed rate of return objective, NGO, NEO, and revenue and pricing principles are better achieved by having regard to the relative merits of the models to achieve the allowed rate of return objective, rather than a starting assumption that all models should be employed.

We have regard to the relative merits of the equity models proposed to us in the subsection below. We find that the SLCAPM is the clearly superior model for estimating return on equity. We do not consider that using the other models submitted by the service providers should be relied upon to directly estimate a return on equity (independently or as part of a multi-model approach) that best contributes to the achievement of the rate of return objective.

Several service providers, including Energex, submitted reports by SFG that commented on how the foundation model binds the effects that other evidence can have. For instance, in its report for Energex, SFG submitted that:[160]

> Evidence that is assigned to the primary subset [the foundation model] defines the range for the parameter, bounding the effect that any other evidence can have. Thus, the weight that is applied to each piece of evidence is determined by the subset to

157 SFG, *The required return on equity for regulated gas and electricity network businesses: Report for JGN, ActewAGL Distribution, Ergon, Transend and SAPN*, May 2014, p. 15; SFG, *The required return on equity: Initial review of the AER draft decisions: Report for Energex*, January 2015, p. 7; SFG, *Using the Fama–French model to estimate the required return on equity: Report for JGN, JEN, ActewAGL, Ausgrid, Ausnet services, AGN, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SAPN, United Energy*, February 2015, p. 5.

158 ActewAGL, *Revised revenue proposal*, January 2015, p. 434.

159 SFG, *The required return on equity for gas and electricity network businesses*, May 2014, p. 89.

160 SFG, *Estimating the required return on equity: Report for ENERGEX*, August 2014, p. 15. SFG made similar arguments in SFG, *The required return on equity: Initial review of the AER draft decisions: Note for ActewAGL, Ausgrid, Essential Energy and Endeavour Energy*, January 2015, pp. 27–40, SFG, *The required return on equity for the benchmark efficient entity: Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, APA, Ausgrid, Ausnet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, February 2015, p. 2.

which it is (somewhat arbitrarily) allocated, rather than by a side-by-side assessment of the relative strengths and weaknesses.

This is a mischaracterisation. Our approach involves the determination of a return on equity estimate in step six after considering all the relevant material (and their relative merits) in step five. For the avoidance of doubt, we note that:

- Categorising material as:
    - material considered at step three (material with a role of informing foundation model parameters), or
    - material considered at step four (material with a role of informing overall return on equity);

  does not imply that one category of material is afforded more weight than the other in informing our final return on equity estimate. Rather, categorising material into step three or step four simply reflects our consideration of the role for the material that would best contribute to the achievement of the allowed rate of return objective given the relative merits of the material.

- Sequential consideration of material does not imply the relative weight afforded to the material. In any process there must be a first step. The consideration of material at step three does not, simply by occurring earlier, limit the weight that can be placed on material subsequently considered at step four, nor does it bound the manner in which material can be considered at step four.

Equity models

In determining the role of the different equity models, we have regard to the information before us during the Guideline process and the new material submitted after this process. The latter includes information submitted in service providers' initial and revised proposals, as well as submissions in relation to these proposals.[161] We also received advice from our consultants on the roles for the various models.[162] Table 3-5 sets out the roles of the equity models we have regard to in this determination.

In the Guideline, we proposed to use several different models to inform our return on equity estimate. We then evaluated each model on its merits and determined the role that they should play in estimating the return on equity. This role would be one of the following: as the foundation model, to inform parameter estimates for the foundation model, to inform our final return on equity point estimate, or not relied upon to estimate return on equity. The models we considered included the SLCAPM, Black CAPM, DGM and FFM.[163] Thereafter, the

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[161] 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.

[162] McKenzie and Partington, *Report to the AER part A: Return on equity*, October 201; Handley, *Advice on the return on equity*, 16 October 2014; Partington, *Report to the AER: Return on equity (updated)*, April 2015; Handley, *Further advice on the return on equity*, 2015.

[163] AER, *Rate of return guideline*, December 2013, p. 13.

Guideline approach (also referred to as the foundation model approach) adopts one model as our foundation model. This is the SLCAPM.

Service providers, in submitting their initial and revised proposals, submitted a large number of deviations from our foundation model approach with respect to the use of these models. The service providers largely submitted the same reasons for and uses of the various models they proposed in the Guideline process. For example, the most recent regulatory proposals proposed estimating allowed the return on equity by either:

- Mechanistically weighting return on equity estimates derived from the SLCAPM, Black CAPM, FFM and SFG's construction of the DGM or;[164]
- Setting the equity beta so that the allowed return on equity equates to that estimated under the method above. This effectively incorporates the SLCAPM, Black CAPM, FFM and DGM into the SLCAPM.[165]

In this preliminary decision, we also consider and respond to information that stakeholders other service providers put before us in their submissions and revised proposals. For instance, in submissions responding to our use of equity models in our November 2014 draft decisions, we received the following:

- Submissions from service providers and associated industry groups. Several service providers individually lodged a submission containing the same material in relation to return on equity models.[166] Other service providers and industry groups lodged different submissions — although, in essence, these supported similar positions.[167]
- Consultant reports submitted by several service providers. These included reports by SFG Consulting on the FFM, Black CAPM, DGM and required return on equity.[168] These also included a report from NERA on the empirical performance of the SLCAPM and Black CAPM.[169]

We respond to this material in appendix A of this attachment.

Table 3-5 sets out the role we have assigned to each of the return on equity models and our reasons for assigning these roles.

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[164] Ergon, *Regulatory proposal — Appendix C: Rate of return*, October 2014, p. 135; SAPN, *Regulatory proposal 2015–20*, October 2014, p. 319.

[165] Energex proposed this approach. See Energex, *2015–20 regulatory proposal*, October 2014, pp. 164–165. SAPN and Ergon Energy proposed this as an 'alternative approach'. See SAPN, *Regulatory proposal 2015–20*, October 2014, p. 319; Ergon Energy, *Regulatory proposal 2015–20*, October 2014, pp. 123, 137.

[166] AGN, AusNet Services, CitiPower/Powercor, JGN, SAPN and United Energy each submitted a submission titled, *Submission in relation to the first round of regulatory determination under the new rules* in 13 February 2015.

[167] ActewAGL, *Submission on the AER's draft decision: ActewAGL distribution determination*, 13 February 2015 (Public version); ENA, *AER draft decisions for NSW and ACT electricity distributors*, 13 February 2015; Ergon Energy, *Submission on the draft decisions: NSW and ACT distribution determinations 2015–16 to 2018–19*, 13 February 2015; Spark Infrastructure, *Submission on the AER's draft decision for NSW electricity distributors*, 13 February 2015.

[168] SFG, *Using the Fama–French model to estimate the required return on equity*, 13 February 2015; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015; SFG, *Share prices, the DDM and the cost of equity for the market and a benchmark energy network*, 13 February 2015; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015.

[169] NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015.

Table 3-5 Role assigned to equity models in estimating the return on equity

Equity model	Role	Reason for chosen role[170]
Sharpe Linter CAPM	Foundation model	When used as the foundation model in our foundation model approach, we expect this to result in a return on equity that contributes to the achievement of the allowed rate of return objective. We consider it is a superior equity model to use as our foundation model relative to alternative models and methods submitted to us. It also best meets our selection criteria.
Fama French Three Factor Model	No role	We do not expect estimates from the model to contribute to the achievement of the allowed rate of return objective. The model is not sufficiently robust or expected to calculate an unbiased return on equity estimate for the benchmark entity facing a similar degree of risk as Energex.
Black CAPM: (a) empirical results (b) theoretical principles	(a) No role (b) Inform equity beta point estimate	(a) We do not expect estimates to contribute to the achievement of the allowed rate of return objective. The model is not sufficiently robust or expected to calculate an unbiased return on equity estimate for the benchmark entity facing a similar degree of risk as Energex. (b) We consider the theory behind the model supports a potentially warranted adjustment to the SLCAPM return on equity estimate in relation to the equity beta to account for market imperfections.
Dividend Growth Models	Limited to using AER two stage and three stage DGMs published at the time of the Guideline to inform the MRP.[171] No role in directly estimating the return on equity of the benchmark efficient entity.	The models and required data are sufficiently robust to estimate a forward looking MRP to inform our choice of MRP. The estimates may be upwards biased and need to be considered in light of this. We do not consider the models and required data are sufficiently robust to directly estimate the return on equity on the benchmark entity. Direct benchmark efficient entity return on equity estimates from the models should not be used as they are not expected to lead to an unbiased estimate of the return on equity or contribute to the achievement of the allowed rate of return objective.
Wright CAPM	Limited to estimating a range to be used to informing the overall	A limited role in potentially informing the return on equity of the benchmark efficient entity The model shows a range where the return on equity could fall varying the SLCAPM input parameters under the assumption that the return on

170 The reason is a high level summary. Full reasons are provided in the following sections, the equity models appendix and in the consultant reports by McKenzie and Partington and Handley.

171 See Appendix C and AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 116–117.

Equity model	Role	Reason for chosen role[170]
	return on equity	equity is stable. In the event the return on equity was outside this range, further investigation could be warranted. There is a lack of theoretical, academic, econometric and applied support for the model's central thesis of a stable return on equity through time (and therefore an inverse relationship between the risk free rate and the MRP). Therefore, we do not expect this will lead to an unbiased estimate of the return on equity, or contribute to the achievement of the allowed rate of return objective.
Long term CAPM specifications	No Role	There is a lack of theoretical, academic, econometric and applied support for the model's central thesis of a stable return on equity through time (and therefore an inverse relationship between the risk free rate and the MRP). Therefore, we do not expect this will lead to an unbiased estimate of the return on equity, or contribute to the achievement of the allowed rate of return objective.

Source: AER analysis.

The remainder of this section discusses the reasons for the role (if any) we assign to the different models in estimating the expected return on equity for this preliminary decision.

SLCAPM

We use the SLCAPM as the foundation model. Consistent with our views expressed in December 2013 and in our draft decisions published in November 2014, we consider this model best meets our assessment criteria.[172] At present, we consider it is superior to all other models that service providers suggested for estimating the expected return on equity by reference to the benchmark efficient entity.[173]

The new material submitted, that was not available at the time of the Guideline, has not changed our view on this. This includes the material in the regulatory proposals, consultant reports, stakeholder submissions and revised regulatory proposals before us. We have regard to this material, which is discussed in appendix A—Equity models.

We consider using the SLCAPM as the foundation model will provide an unbiased estimate of the cost of equity capital. We consider the SLCAPM is the most appropriate model to use for reasons including:

172 AER, *Explanatory Statement rate of return guideline*, 17 December 2013, p. 64. See for example AER, *Draft decision ActewAGL distribution determination, Attachment 3*, November 2014, pp. 165–173 (also see draft decisions for Ausgrid, Endeavour Energy, Essential Energy, Directlink, JGN, TasNetworks and TransGrid).

173 That is, the FFM, Black CAPM and SFG's construction of the DGM.

- It is widely used for estimating the expected return on equity for regulated companies. This includes use by academics, market practitioners and other regulators.[174]
- The SLCAPM, estimated as the sum of the risk free rate and the product of the equity beta and MRP, is relatively simple to implement. Further, robust, transparent and replicable analysis supports estimates of its input parameters.
- Other relevant material can inform the SLCAPM parameter estimates. We consider this may mitigate limitations of the model.[175] The approach, therefore, facilitates the inclusion of a broad range of material, but still provides some certainty to stakeholders as to the final return on equity value, consistent with their stated desires.[176]
- The SLCAPM can provide both a range of estimates, and a point estimate from within this range. This functionality provides further predictability to stakeholders regarding the final return on equity value.
- Contrary to what some submissions indicated, there is no compelling evidence that the return on equity estimate from the SLCAPM will be downward biased given our selection of input parameters.
- Contrary to what some submissions indicated, we do not consider the alternative return on equity estimates provided by the service providers demonstrate our return on equity is too low.[177]

We assessed the SLCAPM against the Guideline assessment criteria in Table 3-6. Following this assessment, we are satisfied that it is the most suitable model to use as the foundation model.

Table 3-6 Summary of our assessment of the SLCAPM against criteria

Criteria	Sharpe–Linter CAPM assessment against criteria
Where applicable, reflective of economic and finance principles and market information. Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	The model reflects economic and finance principles. It is a theoretically based equilibrium asset pricing model. It transparently represents a core paradigm of modern finance — the risk return trade-off. Its parameters are estimated with robust market data (proxies for the risk free rate based on government bonds, equity beta based on observed covariance of returns for

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

175 For instance, McKenzie and Partington expressed significant reservations about the implementations of the alternative models as the service providers proposed. See McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 9.

176 During the Guideline development process, consumer groups broadly supported the foundation model approach. See COSBOA, *Comments – draft guideline*, October 2013; Ethnic Communities' Council of NSW, *Submission to Better Regulation: Draft rate of return guidelines*, 10 October 2013; EUAA, *Submission to the draft guideline*, October 2013, p. 2; MEU, *Comments on the draft guideline*, October 2013, p. 25; PIAC, *Submission to the draft guideline*, October 2013, p. 29.

Criteria	Sharpe–Linter CAPM assessment against criteria
	proxy firms with the returns on a market proxy, and estimates for the MRP based on a range of information). Empirical shortcomings of the model may be addressed through exercising regulatory judgement in determining final inputs into the model.
Fit for purpose. That is, 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. Also, promote simple over complex approaches where appropriate	The model was developed to predict equilibrium expected returns on risky assets.[178] This is consistent with its use to set the regulated return on equity. The model is relatively simple to implement, making it preferable to more complex models (all else equal). We consider that the careful application of the model, as we have done in the foundation model approach, will tend to give estimates of the return on equity that are sensible and reasonable over time.[179]
Implemented in accordance with good practice. That is, supported by robust, transparent and replicable analysis that is derived from available credible datasets	The input parameters (risk free rate, equity beta, and MRP) can be estimated with tolerable accuracy in line with good market practice. The SLCAPM is widely used for estimating the expected return on equity for regulated companies. This includes by academics, market practitioners and other regulators. The estimation of these inputs is easily replicable based on available and credible datasets.
Where models of the return on equity and debt are used these are: - based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in inputs estimation - based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound rationale. The econometric derivation of input parameters, where this is used, leads to concerns about the potential for data mining.	It is less complex to estimate the input parameters for the SLCAPM, than it is for the Black CAPM and the FFM. This implies: - The estimation of input parameters is likely to be relatively robust and less likely to be unduly sensitive to errors. - The choice of data used in estimating inputs to the model is more likely to avoid arbitrary filtering or adjustment as it can be more clearly based on sound rational and/or common practice.
Where market data and other information is used, this information is:	All information used in the estimation of the model is credible and verifiable and can be clearly sourced.

178 Bodie, Z., Kane, A., Marcus, A.J., *Investments*, Ed. 5, McGraw-Hill Irwin, 2002, p. 263. By definition, all assets other than risk free assets are risky.

179 Handley supports our use of the SLCAPM as the foundation model in the foundation model approach a reasonable. See Handley, *Advice on the return on equity*, October 2014, pp. 3–5.

Criteria	Sharpe–Linter CAPM assessment against criteria
- credible and verifiable - comparable and timely - clearly sourced.	Information will generally be comparable and timely, although we note there is often a trade-off between timeliness and stability (for example, in relation to the period over which to estimate the forward looking equity beta or MRP using historical data).
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	The model can adjust to changing market conditions through the adjustment of input parameters. While the forward looking risk free proxy can immediately adjust through observable CGS yields, empirical estimates of the other parameters (particularly the equity beta) may adjust more slowly due to their higher reliance on historical information.

Source: AER analysis.

Following the submission of regulatory proposals in May and June 2014, we commissioned Professor Michael McKenzie and Associate Professor Graham Partington (McKenzie and Partington) to review the use of the SLCAPM as the foundation model. This was in consideration of the service providers' full proposals and supporting documents.[180] We also commissioned Associate Professor John Handley (Handley) to undertake a subsequent high level review of the foundation model approach. This review was in light of McKenzie and Partington's report, the service providers' proposals and three relevant consultant reports (CEG, NERA and SFG) that service providers submitted to support their proposals.[181] While Ergon Energy and SAPN submitted their regulatory proposals after we commissioned these reports, both these businesses submitted the same SFG report that our consultants analysed.[182] Further, Energex based its return on equity estimate on a methodology contained within this SFG report, which SFG updated in a report for Energex.[183]

The reports from both McKenzie and Partington and Handley supported our use of the SLCAPM as the foundation model.[184] Both reports indicated that the authors considered the foundation model approach (using the SLCAPM as the foundation model) would be

180 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014.

181 Handley, *Advice on the Return on Equity*, 16 October 2014. For the three key expert reports, see CEG, *WACC estimates: A report for NSW DNSPs*, May 2014; NERA, *Return on Capital of a Regulated Electricity Network*, May 2014; SFG, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon and Transend*, May 2014.

182 That is, SFG, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon and Transend*, May 2014.

183 SFG, *Estimating the required return on equity: Report for ENERGEX*, 28 August 2014.

184 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 9–14; Handley, *Advice on the return on equity*, 16 October 2014, p. 4.

expected to contribute to the achievement of the allowed rate of rate of return objective.[185] Partington restated this position in his subsequent report.[186]

McKenzie and Partington indicated with respect to the SLCAPM:[187]

> 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. It remains that case that the majority of international regulators currently base their decisions primarily on the CAPM framework.

McKenzie and Partington then stated:[188]

> The consultants raise concerns with the ability of the CAPM to provide an adequate characterisation of the relationship between risk and return. Their concerns are largely driven by the ability of modern multifactor asset pricing models to provide a more adequate explanation of the cross section of realised average returns. It is important to recognise that the cross section of average returns is only one dimension of interest when modelling the risk-return relationship. Further, recent work suggests that the evidence against the CAPM may not be as robust as previously thought. For example, Ray, Savin and Tiwari (2009) show that the statistical evidence for rejecting the CAPM is weaker than previously thought when more appropriate statistical tests are used. More importantly, Da, Guo and Jagannathan (2012) argue that the empirical evidence against the capital asset pricing model (CAPM) based on stock returns does not invalidate its use for estimating the cost of capital for projects in making capital budgeting decisions. Their argument is that stocks are backed not only by projects in place, but also by the options to modify current projects and even undertake new ones. Consequently, the expected returns on equity need not satisfy the CAPM even when expected returns of projects do. Thus, their findings justify the continued use of the CAPM irrespective as to one's interpretation of the empirical literature on asset pricing.

Handley indicated with respect to the SLCAPM:[189]

> [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.

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185 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 13–14; Handley, *Advice on the return on equity*, 16 October 2014, p. 3.

186 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 33.

187 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 9.

188 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 9–10.

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

We consider evidence suggests our use of the SLCAPM in our foundation model approach would be expected to promote efficient investment and use of regulated infrastructure.[190] This is because we consider the regulatory regime has been supportive of investment and the service providers we regulate appear to have raised capital to support their investment programs. We consider the movements in debt market yields since our regulatory decisions in 2009 are consistent with the return on equity estimates from our application of the SLCAPM. We consider our choice of SLCAPM input parameters should lead to a rate of return that contributes to the achievement of the allowed rate of return objective. For instance:

- Our risk free rate proxy reflects the current conditions in the market for capital and is an unbiased estimator of the risk free rate that should be used in the SLCAPM.[191]
- Our MRP of 6.5 per cent is a fair estimate of the excess required return on the market over the risk free rate, having regard to all the information before us.[192]
- Our beta of 0.7, selected from the upper end of our estimated range, has been chosen with reference to a range of material considered on the basis of merit.[193]
- Our use of the SLCAPM and input parameters are consistent with the approaches employed by investors.[194]

McKenzie and Partington considered whether anything indicated the foundation model approach using the SLCAPM as foundation model would be expected to result in a return on equity estimate that is systematically downward biased. In response, McKenzie and Partington supported our application of the foundation model.[195] They stated:[196]

> We are of the view that the foundation model does not provide a downwardly biased estimate in this context.

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190 Handley advised 'investors who supply capital to the benchmark efficient entity should receive a fair compensation having regard to the level of risk that they face…The AER's choice of the Sharpe-CAPM as the foundation model is entirely appropriate and reasonable for this purpose'. Handley, *Advice on the return on equity*, October 2014, p. 4. Given the SLCAPM provides fair compensation for the appropriate forward looking time frame (which we consider to be 10 years), we expect this would promote efficient investment and contribute to the achievement of the allowed rate of return objective.

191 See step three of the reasons for our return on equity decision.

192 See step three of the reasons for our return on equity decision and in the MRP appendix.

193 See step three of the reasons for our return on equity decision and in the equity beta appendix.

194 We considered 32 independent valuation reports dated between 27 April 2013 and 31 July 2014 that contained a discounted cash flow analysis. All but four of these reports used a model other than the SLCAPM (the DGM) to estimate the return on equity. Three of these four reports only used the DGM as a cross-check on an initial SLCAPM estimate. The remaining report used the DGM to directly estimate the value of the proposed transaction). See: DMR Corporate, *Re: Independent Expert's Report*, Report prepared for ILH Group Ltd, 23 July 2013, Grant Samuel & Associates Ltd:, *Financial Services Guide and Independent Expert's Report in relation to the proposal by Murray & Roberts Holdings Ltd*, 11 October 2013; *Financial Services Guide and Independent Expert's Report in relation to the proposal to internalise management*, 7 February 2014; *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-Committee in relation to the proposal by APA Group*, 4 March 2014.

195 See Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 33; McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 14.

196 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 14.

> The theoretical justification for a downward bias has previously been considered in McKenzie and Partington (2012, p. 19-20) and they do not find in favour of this argument in this context. We also do not view the statistical justification (see SFG (2013a, p. 5), SFG (2014a, p. 10-12) for a discussion of the Vasicek adjustment) as valid in this context. For the latter, 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)

Handley noted in relation to the evidence (from other models) on low beta bias:[197]

> [i]n considering the relevance of this evidence, however, it is important to recognize that the current objective is to determine the fair rate of return given the risk of the benchmark efficient entity rather than to identify the model which best explains past stock returns.

Further, in Handley's subsequent report, he clarified the key point of this statement as:[198]

> (i) given there are multiple possible (but not necessarily mutually exclusive) explanations for the low beta bias – some of which are risk based explanations and some of which are not; and
>
> (ii) the allowed rate of return objective makes it clear that the rate of return should reflect the risk of the benchmark efficient entity,
>
> then there is doubt as to whether the empirical finding of a low beta bias is relevant for the purposes of determining an appropriate level of compensation since there is doubt as to whether the low beta bias reflects risk (over and above that already captured by the Sharpe-CAPM).

In April 2015, after reviewing material submitted in additional proposals, revised proposals and submissions, Partington maintained his support for our use of the SLCAPM as the foundation model. He found that none of the information and arguments presented in the revised proposals and submissions would give him cause to change from his positions in McKenzie and Partington's 2014 report.[199]

In determining if the SLCAPM is appropriate to use as the foundation model in our foundation model approach, we also considered if service providers' alternative return on equity estimation methods would be expected to lead to a 'better' estimate of the return on equity. We conclude that they would not, for the reasons discussed in the following paragraphs. In particular, we have reservations with how service providers have applied these alternative models.

197 Handley, *Advice on the return on equity*, 16 October 2014, p. 5.

198 Handley, *Report prepared for the AER: Further advice on the return on equity*, April 2015, pp. 5–6.

199 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 12. Reference to McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014.

McKenzie and Partington also examined if the addition of return on equity estimates from other models and sources as proposed by the service providers would be expected to lead to a 'better' estimate of the return on equity. They concluded, 'to the extent that these alternative estimates are well founded, unbiased and appropriately combined, then we would say that such models might be useful in triangulating the cost of equity'.[200] However, they also expressed reservations about the implementations of the alternative models as the service providers proposed.[201] They considered there were problems with applying these alternative models, particularly in the Australian context. Partington also found there was little consensus on the implementation of these models in Australia and there was substantial variation in the estimated parameters.[202] Regarding applying a multi model approach, Partington advised there is no assurance that adding more information will not lower the quality of the estimate. Further, a number cannot be taken as meaningful without fully understanding the context in which it is estimated.[203]

We consider McKenzie and Partington's reviews of the alternative models indicated that the alternative return on equity estimates provided by the service providers should not be used for estimating the return on equity by reference to a benchmark efficient entity. We also consider their review indicated that these alternative return on equity estimates provide no compelling evidence that our return on equity would undercompensate a benchmark entity facing a similar degree of risk as Energex relative to its efficient equity financing costs.

Handley also supported our decision to not depart from the foundation model approach. He wrote that there is nothing in the regulatory proposals and the three key consultant reports that provide compelling reasons to depart from the core framework underpinning the foundation model approach.[204] Having considered the FFM, the Black CAPM, and the DGM put forward by the service providers to estimate the return on equity, Handley stated:[205]

> there are, however, limitations with each of these models that either restricts or preclude their role in determining a return on equity consistent with the allowed rate of return objective.

We have considered service providers' proposed alternatives to estimating the return on equity using a multi model approach. We have also considered their use of return on equity estimates from the alternative models to inform the SLCAPM input parameters. We do not consider these uses of alternative models would contribute to the achievement of the allowed rate of return objective. Rather, we are satisfied with using the SLCAPM as our

200 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 34; McKenzie and Partington, *Report to the AER part A: return on equity*, October 2014, p. 14.

201 McKenzie and Partington, *Report to the AER part A: return on equity*, October 2014, p. 14.

202 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 15.

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

204 Handley, *Advice on the Return on Equity*, 16 October 2014, p. 6. For the three key expert reports, see CEG, *WACC estimates: A report for NSW DNSPs*, May 2014; NERA, *Return on Capital of a Regulated Electricity Network*, May 2014; SFG, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon and Transend*, May 2014.

205 Handley*, Advice on the return on equity*, 16 October 2014, p. 6.

foundation model. The return on equity estimates provided by NERA, CEG and SFG do not provide compelling reasons to depart from this position.[206]

Further discussion of the SLCAPM is contained in appendix A—Equity models.

Fama French Three Factor Model (FFM)

We do not rely on the FFM to inform our estimate of the return on equity of the benchmark efficient entity. We do not consider the FFM is currently suitable for our regulatory task. We therefore do not employ it in our six step process, including not using it for:

- Estimating the return on equity for the benchmark efficient entity.
- Performing a cross check on whether other models (including the SLCAPM) produce reasonable estimates of the return on equity that would contribute to the achievement of the allowed rate of return objective.

Having reviewed the new material submitted since the publication of the Guideline, we remain of the view the FFM is not suitable for our regulatory task.[207] This is for the same reasons we stated in the Guideline. The key reasons for not using the model are:

- It does not appear sufficiently robust and is sensitive to different estimation periods and methodologies.
- It is not clearly estimating ex ante required returns.
- It suffers a lack of theoretical foundation, which might explain the instability of parameter estimates.
- It is relatively complex to implement.

These are consistent with the views we expressed in the Guideline. The Guideline indicated we would not use the FFM; which largely did not meet our assessment criteria.[208] Table 3-7 sets out our assessment of the FFM against our assessment criteria.

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[206] Handley, *Advice on the Return on Equity*, 16 October 2014, p. 6. For the three key expert reports, see CEG, *WACC estimates: A report for NSW DNSPs*, May 2014; NERA, *Return on Capital of a Regulated Electricity Network*, May 2014; SFG, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon and Transend*, May 2014.

[207] ActewAGL, AGN, Ausnet Services, CitiPower/Powercor, Energex, Ergon Energy, JEN, JGN, the NSW distributors, SAPN and United Energy submitted SFG, *Using the Fama–French model to estimate the required return on equity*, 13 February 2015. ActewAGL and the NSW distributors submitted material on the FFM in SFG, *The required return on equity: Initial review of the AER draft decisions,* January 2015, pp. 17–22. ActewAGL, Ergon Energy, JGN, SAPN and TransGrid submitted SFG, *The Fama–French model*, May 2014. ActewAGL, Ergon Energy, JGN and SAPN also submitted material on the FFM in SFG, *The required return on equity for regulated gas and electricity network businesses,* May 2014, pp. 33–37. Energex also submitted material on the FFM in SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014. The NSW distributors submitted Grundy, *Letter to CFO, Networks NSW*, 9 January 2014.

[208] 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 .

Table 3-7 Summary of our assessment of the FFM against criteria

Criteria	FFM assessment against criteria
Where applicable, reflective of economic and finance principles and market information. Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	Beyond market risk, there is no clear theoretical justification for the risk factors the FFM model captures. There is no widely accepted method or specification for estimating the model.
Fit for purpose. That is, 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. Also, promote simple over complex approaches where appropriate	The model is not fit for determining the regulatory return on capital. Its original development was empirically motivated and it is unclear whether it is estimating ex-ante returns. The model is also complex with no clearly correct specification. It also has serious limitations given its lack of stability under different specifications and lack of theoretical basis. The original purpose of the model appears to have been to develop a factor model that better fitted realised return cross sectional data. The model has been applied in numerous different ways (principally by academics) in attempting to do this. There are numerous specifications of the model that produce different estimates of the realised return on equity. There is no clearly superior specification. It is unclear whether any given application of the model is estimating an ex-ante required return on equity.
Implemented in accordance with good practice. That is, supported by robust, transparent and replicable analysis that is derived from available credible datasets	There is no accepted good practice with respect to implementing the FFM because there is no widely accepted correct method of applying the model (that is, specification). This makes the model empirically unstable. While we accept a given application of the FFM may be transparent and replicable, we do not consider the model overall is robust. The model's use for estimating expected returns on equity appears limited. This includes very limited use, if any, by other regulators.[209] Australian firms do not broadly use the FFM when valuing equity.[210]
Where models of the return on	The econometric derivation of the model leads to concerns

209 McKenzie and Partington noted the general regulatory preference has clearly been for using the SLCAPM. See McKenzie and Partington, *Risk, asset pricing and WACC*, June 2013, p. 32.

210 McKenzie and Partington found there is little evidence of companies using the FFM to estimate their cost of capital. See McKenzie and Partington, *Risk, asset pricing and WACC*, June 2013, p. 32.

Criteria	FFM assessment against criteria
equity and debt are used these are: – based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in inputs estimation – based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound rationale	about the potential for data mining. We consider the model may be applied to come up with a desired output (that is, a higher or lower estimate of the required rate of return).[211] This creates significant concerns for its use in setting regulated returns (even if all the other issues with the model could be overcome). The model is insufficiently robust to not be unduly sensitive to errors in input estimation. In applying the model, there is scope for arbitrary filtering or adjustment of data without sound rational.[212] This is due to the econometric nature of the model and the assumptions and specification choices that must be made in estimating the model.
Where market data and other information is used, this information is: – credible and verifiable – comparable and timely – clearly sourced.	We consider the model can be applied using information that is credible, verifiable, comparable, timely and clearly sourced. However, we note that meeting this assessment criterion does not make the output of any given model a valid estimate of the required return on equity.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	We consider the model is sufficiently flexible to allow for changing market conditions through the adjustment of input parameters. However, this is more problematic than the SLCAPM because of the difficulty in empirically estimating additional input parameters. As with the prior assessment criterion, meeting this assessment criterion does not make the output of any given model a valid estimate of the required return on equity.

Source: AER analysis.

The service providers submitted information in support of using the FFM for estimating the return on equity. This includes submitting responses to a number of key reasons we gave for not using the model at the time we published the Guideline.[213] The majority of service

[211] We consider that the FFM provides great scope for data mining given McKenzie and Partington advised: 'The evidence suggests that the estimates for Australia using the Fama and French approach are unstable and depend on both the cross section of firms selected and the sample period chosen'. Further, McKenzie and Partington warned the FFM, 'may indeed lead to invalid, incorrect or misleading inference'. See McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 18.

[212] We consider this is for similar reasons to why the FFM has scope for data mining. See McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 18.

[213] ActewAGL, Ergon Energy, JGN, SAPN, TransGrid submitted SFG, *The Fama–French model*, May 2014. ActewAGL, Ergon Energy, JGN and SAPN submitted material on the FFM in SFG, *The required return on equity for regulated gas and electricity network businesses,* May 2014. TransGrid submitted material on the FFM in NERA, *Return on capital of a regulated electricity network*, May 2014. Energex also submitted material on the FFM in SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014.

providers hold the opinion that we should use the FFM empirically for estimating the return on equity capital. The service providers proposed using their empirical estimates of the return on equity from the FFM to do one or more of the following:[214]

- To estimate their proposed return on equity as part of a multi model approach.[215]
- To provide evidentiary support that their estimate of the return on equity is reasonable and will lead to a rate of return that meets the allowed rate of return objective.[216]
- To provide evidence that the foundation model approach as set out in the Guideline will not lead to a rate of return that meets the allowed rate of return objective.[217]

We consider it is difficult and complex to evaluate any given implementation of a FFM. When surveying the recent UK literature on estimating the FFM, Michou, Mouselli and Stark (2014) identified nine different methodologies.[218] The nine methodologies generated substantially different results. Five of the nine methodologies yielded a significant size premium, but the other four did not. Four of the nine methodologies generated a significant value premium, but the other five did not. One principal conclusion of Michou, Mouselli and Stark is that the results of the FFM are highly sensitive to the methodology chosen. This is such that:[219]

> 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.

Further, McKenzie and Partington considered the FFM in light of the service providers' proposals in detail. They supported our decision to not use the model. They expressed the following views about the model:[220]

- They did not consider the FFM capable of reliably estimating the return on equity of the benchmark efficient entity. This is because the FFM is used to estimate the average return in the cross section. But the benchmark efficient entity is not average given its low risk. The evidence suggests the model is unstable for Australia and depends on both the cross section of firms selected and the sample period chosen.

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214 Service providers proposed using the FFM in SAPN, *Regulatory proposal 2015–20*, October 2014, p. 319; Energex, *2015–20 regulatory proposal*, October 2014, pp. 164–165; Ergon Energy, *Regulatory proposal — Appendix C: Rate of return*, October 2014, pp. 128–135; Ausgrid, *Regulatory proposal*, May 2014, pp. 79–85; Endeavour Energy, *Regulatory proposal, May 2014*, pp. 119–127; Essential Energy, *Regulatory proposal*, 30 May 2014, pp. 104–1113; TransGrid, *Revenue proposal*, May 2014, pp. 12–13, 188-191; ActewAGL, *Regulatory proposal 2015-19 subsequent regulatory control period*, 2 June 2014, pp. 261–276; JGN, *2015-20 access arrangement information, Appendix 9.03 Return on equity proposal*, 5 June 2014, pp. 1–2.

215 SAPN, Ergon Energy, Energex, TransGrid, ActewAGL and JGN.

216 Ausgrid, Endeavour Energy, Essential Energy, TransGrid, ActewAGL and JGN.

217 Ergon Energy, Ausgrid, Endeavour Energy, Essential Energy, TransGrid and JGN.

218 Michou, M., Mouselli, S., Stark, A., 'On the differences in measuring SMB and HML in the UK - Do they matter?', *British Accounting Review*, Vol. 30, 2014, pp. 1–14.

219 Michou, M., Mouselli, S., Stark, A., 'On the differences in measuring SMB and HML in the UK - Do they matter?', *British Accounting Review*, Vol. 30, 2014, p. 12.

220 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 15–19.

- They did not consider the FFM likely to produce stable empirical estimates. Partington considered the parameter instability in the literature as symptomatic of the model's weakness.[221]

Handley also reviewed the service providers' proposals and some relevant consultant reports.[222] He also supported our decision to not depart from the foundation model framework in light of these submissions.[223] Handley noted with respect to the FFM:[224]

- The empirical evidence in support of the FFM does not necessarily mean the FFM is an appropriate model to estimate the allowed return on equity.
- The empirical evidence in support of the model is now being questioned. The evidence in support of the model may be largely an artefact of using portfolios (as opposed to individual assets) to test the performance of the model. After considering SFG's response submitted with the revised proposals in January 2015, Handley clarified his original position.[225] We are satisfied that SFG's response does not raise any new material that requires us to change our views on the FFM.
- The model is not clearly determining return on the basis of risk. And, if the model is not determining returns on the basis of risk:[226]

> then the model would not be appropriate for compensation purposes since by definition the resultant estimates of the return on equity would be inconsistent with the allowed rate of return objective.

Finally, while we have not used the FFM for this decision, we acknowledge that the model might be suitable for regulatory use in the future if its key issues could be overcome. However, we consider it is unlikely the FFM will be suitable for regulatory use in the near term given the discussions in this decision and the issues still facing the model over 20 years since it was developed.

Further discussion of the FFM, the service providers' submissions on the FFM and our responses to these submissions is contained in appendix A — Equity models.

Black CAPM

We use the theory underpinning the Black CAPM to inform our choice of the equity beta point estimate. We do not consider empirical estimates from the Black CAPM are currently suitable for our regulatory task (see Table 3-8 below).

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221 Partington also expressed this concern in Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 38.

222 Specifically, we requested Handley to carefully consider the material in CEG, *WACC estimates: A report for the NSW DNSPs*, May 2014; NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014; SFG, *The required return on equity for regulated gas and electricity network businesses: Report for JGN, ActewAGL, Ergon, Transend and SAPN*, June 2014.

223 Handley, *Advice on the return on equity*, 16 October 2014, pp. 6–9.

224 Handley, *Advice on the return on equity*, 16 October 2014, pp. 7–9.

225 Handley, *Report prepared for the AER: Further advice on the return on equity*, April 2015, pp. 3–4.

226 Handley, *Advice on the return on equity*, 16 October 2014, p. 8.

We consider the theory behind the Black CAPM demonstrates that an uplift to the raw beta estimate may be appropriate due to concerns around market imperfections affecting the SLCAPM. We consider this is consistent with our proposed use of the model in the Guideline. However, we do not consider the Black CAPM (of itself) justifies any given uplift to the SLCAPM beta for low beta stocks as a given uplift cannot be quantified from the model. McKenzie and Partington support this view.[227]

Having reviewed the new material submitted since the publication of the Guideline, we remain of the view that empirical estimates of the return on equity from the Black CAPM are not suitable for use in setting the regulated return on equity.[228] This is for the following key reasons:

- The model is not empirically reliable.[229] This is supported by Partington.[230]
- To our knowledge, the model is not widely used to estimate the return on equity by equity investors, academics or regulators.[231]

These views are consistent with the Guideline.[232] Table 3-8 shows the model does not meet our assessment criteria well.

Table 3-8 Summary of our assessment of the Black CAPM against criteria

Criteria	Black CAPM assessment against criteria
Where applicable, reflective of economic and finance principles and market information. Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	The Black CAPM reflects economic and finance principles. However, we consider the empirical implementation of the model is unreliable. We remain of the view that there are difficulties with aligning the theoretical model with available empirical analysis
Fit for purpose. That is, use of estimation methods, financial models, market data and other	We consider the empirical application of the Black CPAM unfit for the purpose of setting or assessing any component of the

[227] Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 44; McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 20–24.

[228] The majority of service providers submitted SFG, *Beta and the Black CAPM*, February 2015 and NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015 and SFG, *the required return on equity for the benchmark efficient entity*, February 2015, p. 12. ActewAGL and the NSW distributors submitted SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015, pp. 11–17.

[229] For a discussion, see AER, *Explanatory statement to the rate of return guideline (appendices)*, 17 December 2013, pp. 69–71.

[230] Partington found the widely divergent estimates of zero beta returns in the Black CAPM previously supplied by regulated businesses' consultants supports that there is little consensus of the implementation of the Black CAPM in Australia. See *Report to the AER: Return on equity (updated), April 2015*, p. 15.

[231] See, AER, *Explanatory statement to the rate of return guideline (appendices)*, 17 December 2013, p. 17; AER, *Final decision: Envestra access arrangement*, June 2011, p. 40.

[232] AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 16–18.

Criteria	Black CAPM assessment against criteria
evidence should be consistent with the original purpose for which it was compiled and have regard to the limitations of that purpose. Also, promote simple over complex approaches where appropriate	allowed return on equity. The model was developed as a theoretical model that could explain empirical results that questioned the predictions of the SLCAPM. While complexity is arguably not a decisive factor, all else equal, we prefer simpler models. The Black CAPM's outputs are sensitive to its complex application and specification choices. We consider this makes it unfit to apply for regulatory purposes at this time.
Implemented in accordance with good practice. That is, supported by robust, transparent and replicable analysis that is derived from available credible datasets	Estimation of the Black CAPM, in particular the return on the zero beta portfolio, is difficult to do in a robust, transparent or replicable manner because of the complexity of the model. For these reasons, we do not consider the model can be empirically implemented in accordance with good practice at this time.
Where models of the return on equity and debt are used these are: - based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in inputs estimation - based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound rationale.	The econometric derivation of the model leads to concerns about the potential for data mining. We consider the model may be applied to produce a desired output (that is, a higher or lower estimate of the required rate of return). This creates significant concerns for its use in setting regulated returns (even if all the other issues with the model could be overcome). The model is insufficiently robust to not be unduly sensitive to errors in input estimation. There is also significant arbitrary filtering or adjustment of data without sound rationale in the application of the model. This is due to the econometric nature of the model and the assumptions and specification choices required in estimating the model.
Where market data and other information is used, this information is: - credible and verifiable - comparable and timely - clearly sourced.	We consider the model can be applied using information that is credible, verifiable, comparable, timely and clearly sourced. However, we note that meeting this assessment criterion does not make the output of any given model a valid estimate of the allowed return on equity.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	We consider the model is sufficiently flexible to allow for changing market conditions through adjusting input parameters. However, this is more problematic than the SLCAPM because of the difficulty in empirically estimating changes in the zero beta return. As with the prior assessment criterion, meeting this criterion does not make the output of any given model a valid estimate of the allowed return on equity.

Source: AER analysis.

We do not consider empirical estimates of the return on equity from the Black CAPM put forward by the service providers and their consultants provide material that alone, or in combination with other material, is useful for our regulatory task. We do not rely on any empirical estimates of the return on equity for the benchmark efficient entity using the Black CAPM. We also do not rely on these estimates to cross check whether other models (including the SLCAPM) produce estimates of the return on equity that would contribute to the achievement of the allowed rate of return objective.

McKenzie and Partington considered the Black CAPM in light of the service providers' initial proposals in detail. Their report supported our decision to not use empirical results from the Black CAPM.[233] Having reviewed the material presented in the revised proposals, Partington found, 'the findings of McKenzie and Partington (2014) would remain unaltered in light of these additional submissions'.[234] Handley also considered the Black CAPM in his report prior to our draft decisions in November 2014, which supported our decision to not use empirical estimates from the model.[235] In summary, we received the following advice from our consultants:

- The model is not based on more realistic assumptions than the SLCAPM. It cannot be directly compared to the SLCAPM as they each involve very different investment strategies.[236] Partington later emphasised that, given this, '[a]ny attempt to compare the Black CAPM and S-L CAPM must be done with great care'.[237]
- While the model might be used for estimating the return on equity for the benchmark efficient entity, the problem is the model can be very sensitive to implementation choices.[238]
- They would not recommend using the service providers' estimates from the Black CAPM to inform the equity beta given the practical difficulties with implementing the model.[239]
- The model (of itself) does not justify any uplift to the equity beta.[240]
- The model is not widely used in practice because the estimation of the zero beta rate is a non-trivial task. This parameter can fall anywhere below the expected return on the market.[241]
- 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.[242]

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233 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 20–25.

234 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 12.

235 Handley, *Advice on the return on equity*, 16 October 2014, pp. 9–12.

236 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 22.

237 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 17. He demonstrated why this was the case in pp. 17–23.

238 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 25.

239 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24.

240 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24.

241 Handley, *Advice on the return on equity*, 16 October 2014, p. 12.

- It is unclear whether low beta bias is a priced risk not already captured by the SLCAPM.[243]

Appendix A—Equity models, includes a further discussion of the Black CAPM, the service providers' submissions with respect to the Black CAPM and our response to these submissions.

Dividend Growth Model (DGM)

We employ the DGM to inform the MRP. We set out the reasons for and application of our preferred DGM construction in the appendices to the Guideline and appendix B—DGM.[244]

Since publishing the Guideline, service providers submitted a variety of material to support using a DGM to estimate the return on equity for the benchmark efficient entity.[245] Having reviewed this material, we remain of the view that estimates of the overall return on equity generated from DGMs are currently not suitable for our regulatory task. We discuss these submissions in appendix A of this attachment.

We remain of the view that it is preferable to employ DGMs only to inform our estimate of the MRP. This is for the following reasons:

- A sufficiently robust data series exists for dividend yields in the Australian market. Whereas, there are insufficient data to form robust estimates of the required return on equity for Australian energy service providers.[246] There are difficulties with constructing credible datasets for implementing industry specific DGMs.[247] Also, there are too few Australian comparator businesses to run DGMs on individual businesses.[248] Partington advised that while there is risk of substantial error in DGM estimates for individual firms, averaging over many firms across the market helps reduce the impact of error.[249]
- There are developed methods for estimating the growth rate of dividends in the Australian market.[250] Whereas, it is unclear if there is a sufficiently robust method for

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242 Handley, *Advice on the return on equity*, 16 October 2014, p. 10.

243 Handley, *Advice on the return on equity*, 16 October 2014, p. 11.

244 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 114–125.

245 Several service providers submitted Grant Samuel & Associates, *AER — Draft decision*, 12 January 2015, pp. 2–4. ActewAGL and the NSW distributors submitted SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015, pp. 23–24. The majority of service providers submitted SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015 and SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, pp. 13–16. With the initial regulatory proposals, service providers submitted SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014; CEG, *WACC estimates, a report for NSW DNSPs*, May 2014, pp. 20–26.

246 AER, *Explanatory Statement to the rate of return guideline (appendices)*, December 2013, p. 15. For instance, in its 2014 report, SFG only used 99 return on equity estimates from analyst forecasts for the network businesses over the period 2002 to 2014.

247 AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 77.

248 AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 119.

249 Partington, *Report to the AER: Return on equity (updated), April 2015*, pp. 58–59.

250 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.

estimating the long term dividend growth rate for Australian energy network service providers.[251]

- There are important limitations of DGMs that limit our ability to use them as a foundation model. For instance, DGMs can have limited robustness given they are highly sensitive to input assumptions regarding short and long term dividend growth rates.[252] This makes DGMs highly sensitive to potential errors in inputs. Further, DGMs may generate volatile and conflicting results. For example, we have observed that, over extended periods of time, DGMs generated significantly higher average returns on equity for network businesses than for the Australian market. We consider this result is implausible because evidence before us indicates that the systematic risk of network businesses is less than the overall market.[253]
- McKenzie and Partington supported our decision not to use DGMs to directly estimate the return on equity.[254] They supported using our construction of the DGM to inform the MRP estimate. However, they flagged concerns around the reliability of DGMs and gave a number of reasons why DGMs are likely to overestimate the return on equity at present.[255]
- We consider SFG overstated the ability of its DGM to produce reasonably robust return on equity estimates at the industry level.[256] For instance, SFG only used its DGM to indirectly estimate the return on equity for the benchmark efficient entity. Similar to us, SFG used its DGM to directly estimate the return on the market as a whole. Specifically, SFG estimated the return on equity for network businesses using the DGM for each of the available analyst estimates. It then subtracted the risk free rate to obtain an equity risk premium for each analyst forecast. It then determined the risk premium ratios by dividing each equity risk premium by the relevant MRP from the DGM.[257] It then took a simple average of these risk premium ratios to derive an average risk premium of 0.94, which it used as an equity beta in the SLCAPM.[258] We note that this method appears inconsistent with how the equity beta is defined in the SLCAPM, as the covariance between the return on the market and the return on the business divided by the variance of the market.[259]

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251 AER *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 15.

252 See Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 59.

253 AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 120-122. The measure of systematic risk (equity beta), indicates that the benchmark efficient entity would face less systematic risk than the market as a whole (which would have an equity beta of 1.0, by definition). See Handley, ***Estimating β: An update***, April 2014.

254 McKenzie, Partington, *Report to the AER Part A: Return on Equity*, October 2014, pp. 39–40.

255 McKenzie, Partington, *Report to the AER Part A: Return on Equity*, October 2014, pp. 26–41.

256 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 2.

257 For instance, if there was an analyst forecast for APA on the 1st of April 2013 the DGM would determine the market value return on equity for that analyst forecast. SFG would subtract the risk free rate from the market value return on equity to determine the ERP for APA for the 1st April 2013. SFG would divide the ERP by the DGM's MRP estimate for the period 1 January 2013 to 30 June 2013 to determine the risk premium ratio. SFG would repeat this for all analyst forecasts for network businesses in its dataset.

258 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 48.

259 Bringham and Daves, *Intermediate financial management*, Ed. 10, Cengage Learning, 2010, p. 49.

Table 3-9 shows our assessment of using the DGM at the overall return on equity level against our assessment criteria.

Table 3-9 Summary of our assessment of the DGM against criteria

Criteria	Assessment of DGM for estimating the return on equity
Where applicable, reflective of economic and finance principles and market information. Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	DGM estimation reflects well accepted finance and economic theory. DGMs are based on the principle that markets are efficient and the present value (that is, market price) of a share reflects the discounted (present) value of its expected future dividends. DGMs make no assumptions on the risk factors that explain the required return on equity.
Fit for purpose. That is, 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. Also, promote simple over complex approaches where appropriate	Our DGMs are relatively simple. We consider the models are fit for estimating a range within which the MRP is likely to fall. While DGMs are used in the Australian context, their use appears limited compared to the SLCAPM. [260]
Implemented in accordance with good practice. That is, supported by robust, transparent and replicable analysis that is derived from available credible datasets	The simplicity of most DGMs enable a given model specification to be estimated in a robust, transparent and replicable manner.
Where models of the return on equity and debt are used these are: - based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in inputs estimation - based on quantitative modelling which	DGMs are highly sensitive to assumptions regarding the short term and long term dividend growth rates. This makes DGMs highly sensitive to potential errors.

[260] DGMs do not appear widely used in the regulatory context. We note that while IPART uses DGMs to inform its estimate of the MRP, it considers this along with additional information like historical excess returns. See IPART, *Review of WACC methodology: Research final report*, 9 December 2013, p. 2. Regarding market practitioners, we considered 32 independent valuation reports dated between 27 April 2013 and 31 July 2014 that contained a discounted cash flow analysis. All but four of these reports used a model other than the SLCAPM (the DGM) to estimate the return on equity. Three of these four reports only used the DGM as a cross-check on an initial SLCAPM estimate. The remaining report used the DGM to directly estimate the value of the proposed transaction). See: DMR Corporate, *Re: Independent Expert's Report*, Report prepared for ILH Group Ltd, 23 July 2013, Grant Samuel & Associates Ltd:, *Financial Services Guide and Independent Expert's Report in relation to the proposal by Murray & Roberts Holdings Ltd*, 11 October 2013; *Financial Services Guide and Independent Expert's Report in relation to the proposal to internalise management*, 7 February 2014; *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-Committee in relation to the proposal by APA Group*, 4 March 2014.

Criteria	Assessment of DGM for estimating the return on equity
avoids arbitrary filtering or adjustment of data, which does not have a sound rationale.	
Where market data and other information is used, this information is: - credible and verifiable - comparable and timely - clearly sourced.	With the exception of the short and long term dividend growth estimates, the input parameters for estimating the DGM are generally credible, verifiable, comparable, timely, and can be clearly sourced. However, evidence suggests analyst forecasts are overly optimistic.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	Theoretically, readily reflects changes in the market data as it reflects changes in dividend forecasts and share prices. However, in practice, DGMs may not track these changes accurately due to biases in dividend forecasts, stickiness with dividends and the practice of financing dividends.[261] DGMs can also generate volatile and conflicting results.[262]

Source: AER analysis.

The majority of service providers submitted we should use empirical estimates from DGMs to estimate the return on equity. The service providers then proposed using their empirical estimates of the return on equity to do one or more of the following: [263]

- To estimate their proposed return on equity (as part of a multi model approach, or to inform input parameters into the SLCAPM).[264]
- To provide evidentiary support that their estimate of the return on equity will contribute to the achievement of the allowed rate of return objective.[265]
- To provide evidence that the foundation model approach as set out in the Guideline will not contribute to the achievement of the allowed rate of return objective.[266]

261 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 26–31.

262 Different consultants have produced widely different DGM estimates over short periods, From March 2012–2013, we considered DGM estimates of the MRP ranging from 5.90–9.56 per cent. See AER, *Final decision: Access arrangement final decision: SPI Networks (Gas) Pty Ltd 2013-17*, March 2013, Part 2, pp. 101–103, Part 3, 50–56.

263 ActewAGL, *Regulatory Proposal 2015–19 Subsequent regulatory control period*, 2 June 2014, pp. 261–276; Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p. 85; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, pp. 128–129; Energex, *Regulatory proposal July 2015 to June 2020*, October 2014, pp. 164–165; Ergon Energy, *Regulatory proposal appendix C: Rate of return*, October 2014, pp. 128–130, 135–137; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp. 114–115; JGN, *2015–20 access arrangement information, appendix 9.03 Return on equity proposal*, 5 June 2014, pp. 1–2, SAPN, *Regulatory proposal 2015–20, October 2014*, p. 319; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp. 12–13, 188–191.

264 Energex, Ergon Energy, SAPN, TransGrid, ActewAGL, JGN.

265 ActewAGL, Ausgrid, Endeavour Energy, Essential Energy, JGN, TransGrid.

We have reviewed the new material submitted since the publication of the Guideline. We do not consider DGM based empirical estimates of the return on equity are suitable for regulatory use. We discuss this in detail in appendix A—Equity models and appendix B—DGM.

McKenzie and Partington considered the DGM in light of the service providers' proposals. McKenzie and Partington did not consider that using estimates from SFG's DGM would lead to a materially better estimate of the return on equity relative to our approach.[267] They also indicated that prior to its use, it would be appropriate to have substantial agreement on its superiority (over established models) in the research literature and/or extensive use of the model in practice.[268] They also indicated that they considered SFG's model could generate virtually any return on equity desired.[269] They did support the use of the DGM to inform the MRP estimate. Although, they indicated concerns around its reliability and gave a number of reasons why there was a significant risk it will over-estimate the MRP and return on equity.

Handley also reviewed the submissions on the DGM and supported our decision to not use estimates based on the SFG model.[270] He considered it inappropriate to use the outputs from a model in a regulatory context where general acceptance and use of the model is not yet established.[271] He also stated regarding DGMs more generally:[272]

> 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 then demonstrated that DGMs shifted the uncertainty to the growth rate. Handley showed that the return on equity estimated using a constant growth DGM simply equalled the expected dividend yield next period plus the growth rate.[273] He then stated that he considered it unclear whether the return on equity estimates from two and three stage models would be any more meaningful.[274]

See Appendix B—DGM for a further discussion of the DGM, the service providers' submissions regarding the DGM, our response to these submissions, and our assessment of the model against our criteria.

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266 ActewAGL, Ausgrid, Endeavour Energy, Ergon Energy, Essential Energy, JGN, TransGrid.

267 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 40.

268 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 27.

269 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 34–35.

270 Handley, *Advice on the Return on Equity*, 16 October 2014, pp. 13–15.

271 Handley, *Advice on the return on equity*, 16 October 2014, p. 15.

272 Handley, *Advice on the return on equity*, 16 October 2014, pp. 13–14.

273 Handley, *Advice on the return on equity*, 16 October 2014, p. 14.

274 Handley, *Advice on the return on equity*, 16 October 2014, p. 15.

Other SLCAPM specifications (Wright and long term CAPMs)

We have not used point estimates of the return on equity from the Wright CAPM specification and historically based 'long term' SLCAPM specification to inform our estimate of the return on equity for the benchmark efficient entity. While we have used a range from the Wright CAPM specification to inform the overall return on equity (the Wright approach), we have placed little reliance on this information given our concerns with this approach.

We consider the point estimates of the return on equity from these non-standard specifications of the SLCAPM are currently unsuitable for:

- Estimating the return on equity for the benchmark efficient entity.
- Performing a cross check on whether other models (including the SLCAPM) are producing reasonable estimates of the return on equity that will contribute to the achievement of the allowed rate of return objective.

Having fully reviewed the new material submitted since the publication of the Guideline, we place limited reliance on the Wright approach to inform the overall return on equity.[275] This is for the same reasons stated in the appendices to the Guideline's explanatory statement.[276] We do not agree with the form of the Wright and historically-based CAPMs. The SLCAPM is a forward looking asset pricing model.[277] 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.[278]

The Wright approach is an alternative implementation of the SLCAPM. This is where the return on the market portfolio and the risk free rate are estimated as separate components of the MRP. 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

The key reasons for not using the return on equity point estimates from these historically based CAPM specifications are:

275 Material submitted on this includes CEG, *WACC 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.

276 AER, *Explanatory statement to the rate of return guideline (appendices)*, 17 December 2013, pp. 24–28.

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

278 McKenzie and Partington advised 'the current marker 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.

- The models are not theoretically justified. The SLCAPM is a forward looking equilibrium asset pricing model and therefore requires forward looking input parameters.[279]
- We consider that no compelling empirical evidence is before us to support the use of the models.
- Market practitioners, academics or regulators do not generally accept these models.[280]
- 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 for the benchmark efficient entity.

Table 3-10 shows we consider these models do not meet our selection criteria particularly well.

Table 3-10 Summary of our assessment of the alternative CAPMs against criteria

Criteria	Long term 'average' specification	Wright specification
Where applicable, reflective of economic and finance principles and market information. Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	The long term average specification assumes the return on equity is very stable through time. This is not supported by well accepted economic and finance principles. The empirical analysis does not clearly support the model specification.	The Wright specification appears to either assume that the standard approach to estimating the risk free rate and MRP is inconsistent; or the real market return on equity is constant and therefore the risk free rate and the MRP are perfectly negatively correlated.[281] The first assumption would be incorrect. The second assumption is not clearly theoretically supported and the empirical evidence is not compelling.[282]
Fit for purpose. That is, use of estimation methods, financial models, market data and	The long term specification is relatively simple to implement.	The Wright specification is relatively simple to implement. However, we do not consider

279 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.

280 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.

281 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, pp. 7, 17; McKenzie and Partington, *Review of the AER's overall approach to the risk free rate and market risk premium*, 28 February 2013, pp. 21–30.

282 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, pp. 17-18.

Criteria	Long term 'average' specification	Wright specification
other evidence should be consistent with the original purpose for which it was compiled and have regard to the limitations of that purpose. Also, promote simple over complex approaches where appropriate	However, we do not consider it fit for estimating a forward looking return on equity since it relies on historical data that are clearly not representative of forward looking parameters.[283] We accept that historical data (such as historical excess returns on the market) may be used as a basis for estimates of the input parameters into the SLCAPM where they are good evidence of forward looking parameters.	it fit for estimating a forward looking return on equity because it relies on historically based estimates that are clearly not representative of forward looking parameters.[284] We accept that historical data (such as historical excess returns on the market) may be used as a basis for estimates of the input parameters into the SLCAPM where they are good evidence of forward looking parameters.
Implemented in accordance with good practice. That is, supported by robust, transparent and replicable analysis that is derived from available credible datasets	The long term specification is transparent and easy to replicate.	The Wright specification is transparent and easy to replicate.
Where models of the return on equity and debt are used these are: – based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in inputs estimation – based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound	The long term specification is an application of the SLCAPM. As outlined in Table 3-6, the SLCAPM performs well against this criterion.	The Wright specification is an application of the SLCAPM. As outlined in Table 3-6, the SLCAPM performs well against this criterion.

283 McKenzie and Partington advised 'the current marker 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.

284 McKenzie and Partington advised 'the current marker 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.

Criteria	Long term 'average' specification	Wright specification
rationale.		
Where market data and other information is used, this information is: – credible and verifiable – comparable and timely – clearly sourced.	The long term specification uses credible, verifiable, publically available market data.	The Wright specification uses credible, verifiable, publically available market data.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	The long term specification is based on historical data and does not reflect changing market conditions.	The Wright specification is based on historical data and does not adequately reflect market conditions.

Source: AER analysis.

Service providers submitted a range of material to support using these models.[285] We largely consider this material in step four in relation to the Wright approach.[286] While we have used the range from the Wright CAPM, we note that Handley questioned the theoretical and empirical support of the model.[287] Accordingly, we have placed little reliance on this information.

Handley considered the Wright CAPM in his report and stated:[288]

> Wright adopts an alternative non-standard approach to estimating the MRP. Rather than treating the MRP as a distinct variable he suggests estimating the return on the market – by estimating the real return on equity and combining this with a current forecast of inflation to give an estimated nominal return on equity – and the risk free rate separately.

285 SFG supported relying on the Wright CAPM to estimate the MRP. The majority of service providers submitted this material in SFG, *The required return for the benchmark efficient entity*, 13 February 2015, pp. 28–33. Energex submitted this material in SFG, *Estimating the required return on equity*, August 2014. ActewAGL, Ergon Energy, JGN, SAPN and TasNetworks submitted this material in SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014. ActewAGL and the NSW distributors submitted a criticism of how we use the Wright approach in SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015. Ausgrid, Endeavour Energy and Essential Energy submitted a report by CEG supporting using a historical SLCAPM – CEG, *WACC Estimates: A report for NSW DNSPs*, May 2014 and CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015. NERA also discussed the Wright CAPM in its report for TransGrid. See NERA, *Return on capital of a regulated electricity network*, May 2014, pp. 80–81

286 For the NSW distributors, we also discuss their positions on their version of the CAPM that uses long term historical parameters in relation to the risk free rate under step three of the foundation model approach.

287 Handley, *Advice on the return on equity*, 16 October 2014, p. 18.

288 Handley, *Advice on the return on equity*, 16 October 2014, pp. 17–18.

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.[289] 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.[290]

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' CAPM specification proposed by a number of service providers.

See appendix A—Equity models for a discussion on service providers' submissions, our response to these submissions, and our assessment of Wright and 'long term' specifications of the CAPM against our criteria.

Risk free rate

Table 3-11 shows we estimate the risk free rate using yields on CGS with a 10 year term. Based on our assessment of this information, Table 3-11 sets out the role we have determined.

Table 3-11 Role of relevant material in determining the risk free rate

Source of information	Use for informing the risk free rate	Reasons for use
Yields on 10 year CGS	Used as the proxy for the risk free rate.	CGS are low default risk securities and their yield is the best proxy for the risk free rate in Australia, as supported by the RBA. [291] This source of information is robust, credible and reflects prevailing market conditions.

MRP

Our assessment in step one has helped us consider the relative strengths and limitations of different sources of information. Table 3-3 sets this out. This has helped us determine the role we give this information in estimating the MRP, as shown in Table 3-12.

289 CEG, *WACC Estimates: A report for NSW DNSPs*, May 2014, pp. 3–4.

290 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.

291 RBA, *Letter to the ACCC: The Commonwealth Government Securities Market*, 16 July 2012, p. 1.

Table 3-12 Role assigned to each source of relevant material in determining the MRP

Source of information	Use for informing the MRP	Reasons for use
Historical excess returns	Given the most reliance	Meets most of the criteria. The main potential limitation is slow response to changes in market conditions. This is not a limitation if investor expectations of the 10 year forward looking MRP move similarly slowly. Further, considering other sources of evidence reduces this limitation.
Dividend growth models (AER's construction)	Given the second most reliance	Meets most of the criteria. The main limitation is its sensitivity to assumptions, which is significant. It is also likely to produce upward biased estimates.[292] Since it can readily reflect changes in market conditions, it complements our use of historical excess returns. However, its tracking ability is limited if it produces inaccurate results.
Survey evidence	Given some reliance (point in time estimate)	Its main strength is that it estimates investor expectations. However, limitations related to survey design and representativeness of respondents can reduce the value of these estimates. Triangulation of survey evidence may reduce these limitations.
Conditioning variables (dividend yields, credit spreads, implied volatility)	Given some reliance (directional information only)	Their main strength is their ability to detect changing market conditions. However, it is difficult to derive an MRP estimate from this information in a robust manner. Academic and empirical evidence on this information is mixed.
Other Australian regulators' MRP estimates	Cross check on how we consider information	This is indirect evidence of the MRP, which we do not use to estimate the MRP. However, we consider it useful to have regard to the approaches other regulators are taking to consider the evidence before them.
Dividend growth models (SFG's construction)	Does not inform our estimate	We consider this DGM is unnecessarily complex and produces unrealistic growth rates. We consider SFG overstates its benefits because it transfers where one makes assumptions, rather than reducing the need to make assumptions (see DGM appendix B–DGM)
Imputation credit	Adjust estimate	This is consistent with economic and finance

292 McKenzie and Partington, *Report to the AER: Part A, return on equity*, October 2014, pp. 26, 28–30; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 46–50, 59.

Source of information	Use for informing the MRP	Reasons for use
adjustment (AER, Brailsford et al)	under the DGM and historical excess returns	principles and empirical analysis indicating market returns comprise of dividends and capital gains. The adjustment is also transparent and replicable.
Imputation credit adjustment (SFG)	Does not inform our estimate	This applies a formula (from Officer) differently to how we apply the Officer framework in the PTRM. Applying the formula, as SFG proposed could cause problems because it is based on perpetuity assumptions and assumes no capital gains.
Independent valuation reports	Does not inform our MRP estimate	More suitable for use at the overall return on equity level because writers of these reports can adjust individual parameters to obtain an overall result.
The Wright approach	Does not inform our MRP estimate	More suitable for informing the overall return on equity because it is designed to provide information at the return on equity level and does not use a direct estimate of the MRP.

In its proposal, Energex applied an MRP estimate based on reports from SFG.[293] SFG based its estimate on historical excess returns, the Wright approach, SFG's construction of the DGM and independent expert reports. We do not agree with the following aspects of this approach:

- Using the Wright approach to estimate the MRP. We consider it fit for purpose to use the Wright approach to inform the overall return on equity.[294] We consider the Wright approach is an alternative implementation of the SLCAPM designed to provide information at the return on equity level. Wright's implementation of the SLCAPM does not use a direct estimate of the MRP.[295] We also do not agree with SFG's submission that using the Wright approach to inform the MRP estimate is the 'regulatory consensus

293 Energex, *Regulatory proposal*, October 2014, pp. 161–163. SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 57. This is attachment 39 to Energex's proposal. Energex also submitted the following reports during the period for submissions: SFG, *The required return on equity: Initial review of the AER draft decision—Report for Energex*, 30 January 2015, p. 43; Energex, *Supplementary response to AER draft decisions re return on equity and gamma*, February 2015, p. 32; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 33.

294 To see how we have regard to the Wright approach at the return on equity level, see Table 3-14.

295 Energex submitted the Wright approach is not an alternative implementation of the SLCAPM, but a method for estimating the return on the market and MRP (see: Energex, *Supplementary response to AER draft decisions re return on equity and gamma*, February 2015, p. 28). We consider this is a matter of labelling that does not affect the substantive content of the analysis.

view'.[296] In determining how we use the Wright approach, we have regard to its merits and limitations by assessing it against the criteria set out in the Guideline (see Table 3-10).

- Using independent valuation reports to estimate the MRP. We consider valuation expert reports and our foundation model estimate of the return on equity are most comparable at the overall return on equity level.[297] This recognises the tendency for writers of these reports to adjust their assumptions and point estimates. These adjustments can be unexplained and can be made to any parameter and/or the expected return on equity.[298] In determining how we use this information, we have regard to its merits and limitations by assessing it against the criteria set out in the Guideline (see Table 3-16).
- Using SFG's construction of the DGM and its proposed imputation adjustment.[299] We consider our construction of the DGM (and our imputation adjustment) is more suitable for estimating the MRP in the regulatory context (see appendix B–DGM and appendix C–MRP).
- Disregarding survey evidence. We consider market surveys can be valuable and we should have some limited reliance on them (see Table 3-3).
- Disregarding evidence from conditioning variables. We consider conditioning variables can be valuable and we should have some limited reliance on them (see Table 3-3).
- Only having regard to selective components of other regulator's approaches.[300] We consider it is valuable to analyse these decisions holistically by considering the final outcome in its complete context (see Table 3-3).

Equity beta

Our assessment in step one has helped us consider the relative strengths and limitations of different sources of information. Table 3-4 sets this out. This has helped us determine the role we give this information in estimating the equity beta, as shown in Table 3-13.

Table 3-13 Role assigned to each source of relevant material in determining the equity beta

Relevant material	Role	Key Reasons
Conceptual analysis	Cross check of Australian empirical estimates	Allows us to form a prior expectation of where the equity beta of a benchmark efficient entity sits relative to the market

[296] See: SFG, *The required return on equity: Initial review of the AER draft decisions—Report for Energex*, 30 January 2015, p. 30; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 30. We do not consider the views of the QCA and ERA are sufficient to establish a 'regulatory consensus view'.

[297] To see how we have regard to the independent valuation reports at the return on equity level, see Table 3-14.

[298] AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, p. 28.

[299] 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.

[300] SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 26, 40, 49.

Relevant material	Role	Key Reasons
		average, but is necessarily qualitative in nature.
Australian empirical estimates	Primary determinant of equity beta range, with significant weight in determining the point estimate	Relevant to the benchmark efficient entity and derived from credible and commonly used estimation methods. Estimates present a consistent pattern that is robust across regression permutations.
International empirical estimates	Inform equity beta point estimate	Much less relevant to the benchmark efficient entity. Estimates are derived from credible and commonly used estimation methods but do not present a consistent pattern of results.
Evidence from the Black CAPM: (a) empirical results (b) theoretical principles	(a) No role (b) Inform equity beta point estimate	Empirical evidence is not reliable because there are major problems deriving a reasonable empirical estimate using the Black CAPM (see Table 3-8). Theoretical principles may account for certain market imperfections that affect the SLCAPM in practice. However, it is necessarily qualitative in nature and difficult to implement in accordance with good practice.
Empirical evidence from SFG's DGM construction	No role	There are numerous problems with SFG's DGM construction (see appendix B–DGM). This is also not a robust method of estimating equity beta as an input to the SLCAPM model.
Empirical evidence from the Fama French three factor model	No role	Empirical implementation is relatively complex and opaque and estimates are sensitive to the choice of input assumptions (see Table 3-7).

In its proposal, Energex submitted that we should give international (primarily US) empirical estimates a determinative role in estimating equity beta for a benchmark efficient entity.[301]

[301] Energex, *Regulatory proposal*, October 2014, p. 164. Energex's consultant, SFG, submitted that a sample of 56 US firms should be included in our comparator set for empirical analysis. It also submitted that the international empirical estimates we consider indicate an extension of our range. We consider these submissions demonstrate SFG's (and Energex's) consideration that we should give international empirical estimates a determinative role in estimating equity beta. See: SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 72, 82 (attachment 39 to

We consider such an approach would not be consistent with the merits of this information (see appendix D–equity beta). In particular:

- We consider international empirical estimates are not fit for purpose because they differ from the benchmark efficient entity, which operates in Australia by definition.
- We consider it is difficult to use international empirical estimates in accordance with good practice because domestic and international equity betas are not directly comparable (countries differ along a number of dimensions which are difficult to quantify).
- We are not satisfied that this approach would produce superior estimates of the domestic equity beta. We consider our comparator set of Australian energy network firms is reflective of the benchmark efficient entity. We also consider empirical analysis of our Australian comparator set has generated consistent and robust equity beta estimates over several years under a range of market conditions.
- We are, accordingly, satisfied that our use of this information, consistent with the Guideline, is appropriate and consistent with the merits of this information.

Energex also submitted that empirical evidence from the Black CAPM, FFM and SFG's DGM construction should be used to inform the equity beta for the SLCAPM.[302] Specifically, Energex submitted a multiple model approach to estimating the equity beta. This approach involved using return on equity estimates from the Black CAPM, FFM and SFG's DGM to reverse engineer equity beta estimates for the SLCAPM. Again, we consider such an approach would not be consistent with the merits of this information. In particular, we do not consider the Black CAPM, FFM and SFG's DGM produce reliable estimates of the return on equity (see Table 3-8, Table 3-7, appendix A–equity models and appendix B–DGM), which in turn, would not produce reliable estimates of the equity beta.

Other information

In addition to equity models, there are a number of other relevant materials that may inform our overall return on equity estimate. Table 3-14 sets out the role we give each source of relevant material, based on our assessment criteria. The role we give to the Wright approach was discussed previously under equity models, but is also included in this table whereas the reasons are discussed above.

Energex's proposal). Energex also submitted the following reports during the period for submissions: SFG, *The required return on equity: Initial review of the AER draft decision—Report for Energex*, 30 January 2015, p. 39; Energex, *Supplementary response to AER draft decisions re return on equity and gamma*, February 2015, pp. 23–24; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, pp. 19–20; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 4, 27–28, 31, 35.

302 Energex, *Regulatory proposal*, October 2014, pp. 164–165. Also see: SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 79, 83–89 (attachment 39 to Energex's proposal); SFG, *The required return on equity: Initial review of the AER draft decision—Report for Energex*, 30 January 2015, pp. 44–45 (submitted during the period for submissions). However, during the period for submissions, Energex also submitted SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 32–33, 35. In this report, SFG submitted that, under our foundation model approach, we should use empirical evidence from the Black CAPM to inform the equity beta for the SLCAPM. It did not refer to the FFM or SFG's DGM. This submission by Energex appears inconsistent with its proposal.

Table 3-14 Role assigned to relevant information in informing the overall return on equity estimate

Relevant material	Role of information	Reasons for role
Wright approach	Directional role to inform movements in overall return on equity	See discussion under equity models.
Return on debt relative to the return on equity	Directional role to inform movements in overall return on equity	Equity investors are residual claimants (after creditors) on a firm's assets in the event of default. But there is no consensus on the size or strength of any relationship between debt and equity returns. Directional evidence may be used with caution.
Return on equity estimates from independent valuation (expert) reports	Directional role to inform movements in overall return on equity	Issues of comparability, timeliness, and adjustments made to suit a different objective mean that point or range estimates are not directly comparable. Directional evidence may be used with caution.
Return on equity estimates from broker reports	Directional role to inform movements in overall return on equity	
Return on equity estimates from other regulators' decisions	Directional role to inform movements in overall return on equity	
Transaction multiples, trading multiple	No role	A transaction multiple may imply that the regulatory rate of return is different to that required by investors, but we cannot know by how much. Given the limited usefulness of this material, and other issues of comparability, we are not satisfied that the rate of return objective is furthered by its use.
Return on equity estimates and profitability measures from financial statements	No role	The practical application of this material is the same as a transaction multiple.

Return on debt relative to the return on equity

Equity investors are residual claimants on a firm's assets in the event of default. For this reason, equity investments are typically riskier than debt investments and that the return on equity should exceed the return on debt.

For our benchmark efficient entity with a similar degree of risk as Energex, we consider that the return on equity is shielded from systematic risk due to:

- natural monopoly positions providing a barrier to competition

- limited demand risk as they supply essential goods with a low elasticity of demand
- the application of revenue control mechanisms, including that:
    - the form of control (such as a revenue cap or average revenue cap) can reduce revenue risk from unexpected changes in demand
    - a revenue control mechanism limits the interest rate risk facing the firm
    - the RAB is indexed to the outturn Consumer Price Index limiting risk from unexpected changes in inflation
    - unexpected costs may be passed through to consumers in some circumstances.

A number of stakeholders also submitted (to this determination process and other concurrent determination processes) that they expect these factors, and others, to create a low risk business environment for regulated gas and electricity network service providers.[303] Origin Energy, in its August 2014 submission on the NSW distribution NSPs' regulatory proposals, also noted the low risk of these businesses. It submitted that the overall cost of capital should not be a long way above the cost of a corporate bond. This appears to indicate that Origin Energy considers the expected return on equity would not be expected to be a long way above the yield to maturity on debt. Origin Energy submitted that the NSPs are shielded from systematic risk due to their monopoly position, the effect of a revenue cap, and pass through provisions, stating:[304]

> As a result of these factors Origin considers that an efficient benchmark cost of capital for these firms is more comparable to a corporate bond rate than that of a company like Origin that manages a diverse array of risks domestically and internationally in several fuels, in a competitive environment, across an integrated supply chain.

Similarly, Queensland Council of Social Services stated:[305]

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303 Origin, *Submission to the NSW electricity distributors' regulatory proposals for 2014–19*, August 2014, p. 7. EUAA, *submission on Ergon Energy regulatory proposal*, 30 January 2015, page 13. EUAA, *submission on Energex regulatory proposal*, 30 January 2015, page 13. Lower Namoi Cotton Growers' Association Inc., *RE: Essential Energy Distribution Determination (2015–16 to 2018–19)*, January 2015, p. 3. Ethnic Communities Council of NSW Inc., *Submission concerning the NSW distribution networks revised revenue proposal 2014-19 submission to AER*, 11 February 2015, p. 2. Energy Markets Reform Forum, *NSW Electricity Distribution Revenue Reset: AER draft decision and revised proposals from Ausgrid, Endeavour Energy and Essential Energy, A response by the Energy Markets Reform Forum*, February 2015, pp. 27, 37. Public Interest Advocacy Centre Ltd, *A missed opportunity? Submission to the Australian Energy Regulator's draft determination for Ausgrid, Endeavour Energy, and Essential Energy*, February 2015, pp. 33, 36, 42. Major Energy Users Inc., *Tasmanian electricity transmission revenue reset: AER draft decision and TasNetworks' revised proposal: a response by The Major Energy Users Inc*, February 2015, p. 52. Origin Energy, *RE: Submission to Queensland electricity distributors' regulatory proposals*, January 2015, p. 16. Queensland Council of Social Service, *Understanding the long-term interests of electricity consumers: submission to the AER's Queensland electricity distribution determination 2015-20*, January 2015, pp. 71–72. Queensland Resources Council, *Ergon Energy Determination 2015–20*, January 2015, p. 7. EUAA, *Submission on SA Power Networks revenue proposal*, January 2015, p. 13. South Australian Council of Social Services, *SACOSS Submission to Australian Energy Regulator on SA Power Networks' 2015-2020 Regulatory Proposal*, January 2015, p. 19–21.

304 Origin, *Submission to the NSW electricity distributors' regulatory proposals for 2014–19*, August 2014, p. 7.

305 Queensland Council of Social Service, *Understanding the long-term interests of electricity consumers: submission to the AER's Queensland electricity distribution determination 2015-20*, January 2015, pp. 71–72.

> In view of the way in which the regulatory arrangements reduce business risk Engineroom considers that the return on investment should approximate that on a debt security rather than on a business exposed to normal market risk.

Although equity investors are residual claimants on a firm's assets in the event of default, we note that the measured return on debt does not, as a strict rule, need to be below the estimated return on equity at any given point in time. This is for two key reasons:

- regulated business debt bears different systematic risk to equity (including inflation risk)
- measured debt yields are typically promised yields as opposed to the expected return on equity estimated for setting regulatory allowances.[306]

Notably, no academic consensus currently exists on the size and strength of any relationship between debt and equity premiums.[307] Given the inconclusive evidence on the size and strength of any relationship between debt and equity premiums, we consider this information is best used in a directional role.

In a concurrent price review, TransGrid proposed using comparison of return on equity estimates to observed bond yields as a reasonableness check on the overall return on equity estimate.[308] This approach broadly aligns with our proposed role for this information.

Table 3-15 below outlines our assessment of this information against our criteria.

Table 3-15 Assessment of return on debt material against criteria

Criteria	Assessment of relevant material against criteria
Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	Comparison of debt and equity premiums is supported by economic theory and finance principles. Complex modelling of precise size and strength of relationship between debt and equity is currently not supported by well-accepted economic principles and consequently has not been undertaken. Return on debt data is robust and sourced from credible and verifiable data sources.
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	Return on debt data published by the RBA does not have any set purpose. Our use of the data is consistent with the make-up of the data. Limitations in interpreting results of comparisons between debt and equity premiums are acknowledged by providing only a directional role to this information.

306 Expected returns on debt may be lower than promised returns after consideration of default risk. For more information, see: McKenzie and Partington, *Report to the AER: The relationship between the cost of debt and the cost of equity*, March 2013, p. 7.

307 McKenzie and Partington, *Report to the AER: The relationship between the cost of debt and the cost of equity*, March 2013, p. 10; Partington, *Report to the AER: Return on equity (updated)*, April 2015, pp. 72–73.

308 TransGrid, *Revenue proposal*, May 2014, p. 188; NERA, *Return on capital of a regulated electricity network*, May 2014, pp. 114–118.

Criteria	Assessment of relevant material against criteria
Promote simple over complex approaches where appropriate	Analysis involves a simple comparison with minimal adjustments to data.
Implemented in accordance with good practice, supported by robust, transparent and replicable analysis that is derived from available credible datasets	Return on debt data is sourced from credible and verifiable data sources. The simple comparison is transparent and replicable.
In relation to models, based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in inputs estimation	Not applicable, analysis involves only a simple comparison.
In relation to models, based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound rationale	Analysis involves a simple comparison that minimises adjustments to data. The comparison is based on a sound rationale from economic and finance principles.
Credible and verifiable	Return on debt data is sourced from credible and verifiable data sources.
Comparable and timely	Comparison to debt premiums is made using most recently available data.
Clearly sourced	Return on debt data is sourced from credible and verifiable data sources.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate	Comparison to debt premiums is made using most recently available data.

Return on equity estimates from other market practitioners

Our foundation model sets out our preliminary estimate of the return on equity for a benchmark efficient entity with comparable risks to Energex. Other market participants may, in the course of their operations, also produce return on equity estimates for entities similar to our benchmark entity. Evidence of return on equity estimates from other market participants is available from independent valuation (expert) reports, broker reports, and other regulators' decisions.

Independent valuation reports (also referred to as independent expert reports) are prepared for listed businesses to provide a valuation of a business, an asset, or a project in the event of certain transactions. These transactions include takeover bids, mergers and schemes of arrangement, acquisitions, divestitures, share buy-backs, and related party transactions. The

Corporations Act 2001, ASX listing rules and ASIC regulatory guides have various provisions requiring such reports. Broker reports are prepared by equity analysts to provide information about listed companies to investors. Broker reports also often include valuations as part of information provided.

Where a valuation is made using the discounted cash flow method, the valuer or broker will estimate a discount rate, typically in the form of a weighted average cost of capital and including a return on equity. Return on equity estimates may also be found in other regulators' decisions.

When the valuation or regulatory decision is for a comparable energy network business, the return on equity estimates contained in the valuation report, broker report, or regulatory decision provides evidence of the return on equity estimates used by market practitioners. We consider this information is relevant material.

As noted by Incenta Economic Consulting,[309] brokers and independent experts providing valuation reports are subject to financial services regulation and regulatory oversight by ASIC.[310] These regulations are designed to safeguard the rigour, impartiality, and transparency of advice provided in broker reports and independent valuation reports. Broker reports and independent valuation reports are also subject to reputational risks and competitive pressures.

The legal frameworks that govern regulatory decisions by other regulators typically require estimation methods and financial models to be based on well–accepted economic and financial principles. Broader administrative law obligations also require analysis to be well reasoned, transparent and publicly available.

However, we also consider there are a number of limitations on the use of this material in setting an allowed rate of return for a regulated business. The main limitations are:

- broker reports and independent valuation reports have a different objective[311] to the allowed rate of return objective, which may affect the return on equity estimates
- lack of transparency on how the return on equity estimates are derived
- return on equity estimates from other market participants may not be completely independent of our foundation model estimate, it may be misleading to place significant reliance on them as a cross-check

309 Incenta Economic Consulting, *Update of evidence on the required return on equity from independent expert reports*, May 2014, p. 6. Incenta Economic Consulting, *Further update on the required return on equity from independent expert reports*, Report prepared for Jemena Gas Networks Jemena Electricity Networks, ActewAGL, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon Energy, Essential Energy, Powercor, SA Power Networks, United Energy, February 2015, p. .

310 The *Corporations Act 2001* requires providers of financial services to be licenced and sets out obligations of licensees. ASIC regulatory guides 111 and 112 govern the content of expert (valuation) reports and the independence of expert (valuation) reports.

311 Brokers and valuers may adjust discount rates to compensate for errors in forecast cash flows. Discount rate estimates by brokers and valuers may also take into account the one-shot nature of the relevant transactions, which may not be consistent with regular regulatory resets. See Appendix E for more detail.

- return on equity estimates from other market participants are generally company specific and therefore not directly comparable to our benchmark entity.

These limitations are discussed further in appendix E–other information. As a result of these limitations, we consider that return on equity estimates from other market participants should inform our overall return on equity, but that:

- only limited reliance should be placed on these materials
- the material should be used in a directional role, as there are concerns about the comparability of other estimates, meaning that greater reliance can be placed on movements in estimates than their levels.

In its 2014 report the CCP proposed that we use information on return on equity estimates from broker reports, valuation reports, and other regulators' decisions to inform our overall return on equity, consistent with our role as stated above.[312]

In a concurrent transmission determination process, TransGrid proposed using Grant Samuel's independent valuation of Envestra to directly inform the return on equity range.[313] We do not consider that TransGrid's proposed role of valuation reports would contribute to the achievement of the allowed rate of return objective given the limitations mentioned above. Energex proposed using broker and valuation reports to inform estimates of the MRP.[314] We note that consideration of MRP estimates from broker and valuation reports is included in our consideration of the overall return on equity estimates from these reports (since the MRP is one component of the overall return on equity). Detailed assessment of these NSPs' MRP proposals are also in appendix C–MRP.

Table 3-16 below outlines our assessment of this information against our criteria.

Table 3-16 Assessment of market practitioner material against criteria

Criteria	Assessment of relevant material against criteria
Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	Comparison of return on equity estimates from various sources is supported by economic theory and finance principles. Other regulators' decisions are generally well supported by clearly sourced material. However, broker reports are typically not provided with supporting explanation, while valuation reports have mixed results. This can make it difficult to ascertain whether or not valuation reports and broker reports are based on accepted economic and finance principles. There is also a concern that, while valuation and broker reports are in line with accepted economic and finance principles relevant to their objective, they may not be in line with the economic and finance principles

312 CCP, *Smelling the roses and escaping the rabbit holes: The value of looking at actual outcomes in deciding WACC—Prepared for the Board of the Australian Energy Regulator*, July 2014, pp. 7–11.

313 TransGrid, *Revenue Proposal*, 2014/15–2018/19, p. 189.

314 Energex, *Regulatory proposal*, October 2014, pp. 163–164. For details, see: SFG, *Estimating the required return on equity: Report for Energex*, August 2014, pp. 49–54.

Criteria	Assessment of relevant material against criteria
	relevant to a regulatory objective.
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	There is a concern that, while valuation and broker reports are in line with accepted economic and finance principles relevant to their objective, they may not be in line with the economic and finance principles relevant to a regulatory objective.
Promote simple over complex approaches where appropriate	Analysis involves a simple comparison with minimal adjustments to data.
Implemented in accordance with good practice, supported by robust, transparent and replicable analysis that is derived from available credible datasets	Other regulators' decisions are generally well supported by clearly sourced material. However, broker reports are typically not provided with supporting explanation, while valuation reports have mixed results. The simple comparison is transparent and replicable.
In relation to models, based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in inputs estimation	Not applicable, analysis involves only a simple comparison.
In relation to models, based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound rationale	Analysis involves a simple comparison that minimises adjustments to data. The comparison is based on a sound rationale from economic and finance principles.
Credible and verifiable	Other regulators' decisions are generally well supported by clearly sourced material. However, broker reports are typically not provided with supporting explanation, while valuation reports have mixed results.
Comparable and timely	Valuation and broker reports are released regularly, but only infrequently for reports containing a discounted cash flow analysis for businesses comparable to our benchmark entity. Other regulators' decisions are also relatively infrequent.
Clearly sourced	Other regulators' decisions are generally well supported by clearly sourced material. However, broker reports are typically not provided with supporting explanation, while valuation reports have mixed results.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as	Valuation and broker reports are released regularly, but only infrequently for reports containing a discounted cash flow analysis for businesses comparable to our benchmark entity. Other

Criteria	Assessment of relevant material against criteria
appropriate	regulators' decisions are also infrequent.

Realised returns

A number of stakeholders submitted that we should consider material on realised returns to equity from transaction multiples and NSPs' financial statements.[315] Transaction multiples involve comparison of the market value (that is, the sale price) with the book value (that is, the RAB) for a relevant asset comparable to the benchmark efficient entity. If the market value is above the book value (a transaction multiple greater than 1 x RAB), this may imply that the regulatory rate of return is above that required by investors. Conversely, when the market value is below the book value, this may imply that the regulatory rate of return is below that required by investors. Realised returns to equity are therefore relevant material.

Caution must be exercised however, before drawing inferences about the regulatory rate of return from transaction multiples. A transaction multiple greater than 1 x RAB might result from factors beyond the regulated rate of return. These could include the buyer expecting to achieve better cash flows than forecast by the regulator by outperforming regulatory forecasts.

Regulated asset sales in the market are infrequent, allowing limited opportunity to conduct this analysis. While asset sales in the future may reflect changes to the overall rate of return that are occurring at present, sales that have already occurred will not.

Ultimately, transaction multiples do not inform us on the specific return investors require. However, if these significantly and persistently differ from one, it may be informative of the reasonableness of our overall rate of return estimates over time and in context of the building block allowances. Overall, we do not consider that providing any significant role to this material would contribute to the achievement of the allowed rate of return objective.

Financial statements can be used to calculate free cash flows to equity which can be compared to our return on equity building block. Realised returns from financial statements

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315 CCP, *Smelling the roses and escaping the rabbit holes: The value of looking at actual outcomes in deciding WACC—Prepared for the Board of the Australian Energy Regulator*, July 2014. CCP, *Response to AER Draft Determination Re: ActewAGL Regulatory Proposal 2014–19*, February 2015, p. 24. Major Energy Users, *Australian Energy Regulator - Tasmanian Electricity Transmission Revenue Reset - AER Draft Decision and TasNetworks Revised Proposal - A response by Major Energy Users Inc*, February 2015, pp. 55–56. Energy Markets Reform Forum, *Australian Energy Regulator - NSW Electricity Distribution Revenue Reset - AER Draft Decision and Revised Proposals from Ausgrid, Endeavour Energy, and Essential Energy, A response by EMRF*, February 2015, pp. 34–35. Energy Users Association of Australia, *Submission to NSW DNSP revised revenue proposal to AER draft determination (2014 to 2019)*, February 2015, pp. 11, 14. Public Interest Advocacy Centre, *A Missed Opportunity?* Submission to the Australian Energy Regulator's Draft Determination for Ausgrid, Endeavour Energy, and Essential Energy, February 2015, p. 36. Energy Users Association of Australia, *Submission to SA Power Networks Revenue Proposal (2015 to 2020)*, January 2015, p. 14. Energy Users Association of Australia, *Submission to Energex Revenue Proposal (2015/16 to 2019/20)*, January 2015, p. 13. Energy Users Association of Australia, *Submission to Ergon Energy (Ergon) Revenue Proposal (2015/16 to 2019/20)*, January 2015, p. 13. Queensland Resources Council, *Ergon Energy Determination 2015–2020*, January 2015, p. 7. Tasmanian Minerals and Energy Council, *TasNetworks Transmission Revenue Proposal 1 July 2014 - 30 June 2019*, February 2015, p. 2.

are therefore relevant material. However, we consider that the usefulness of this material is limited and its benefits can also be provided by other material.

Differences in regulatory return on equity allowances and the return to equity holders from financial statements could be due to a range of factors. These include the financial statements including cash flows from unregulated activities and/or outperformance of regulatory benchmarks. If a comparable business had no unregulated activities and no outperformance of other regulatory benchmarks (including demand forecasts), the return on equity from financial statements should align with regulatory allowances. But this would simply be due to the business being regulated. In order to draw inferences about investors' required return on equity (and differences between it and our regulatory return on equity) we would need a measure of the market value of the business. This would need to be taken from recent asset sales or the market capitalisation of the business based on current share prices—effectively analysis of transaction multiples.

Table 3-17 below outlines our assessment of this information against our criteria.

Table 3-17 Assessment of realised returns against criteria

Criteria	Assessment of relevant material against criteria
Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	The concept that a RAB multiple above or below one may be reflective of a regulatory return on equity that is not reflective of investors' required return on equity is supported by economic and finance principles. But economic and finance principles do not inform us of how far a regulatory return on equity may be from investors' required return on equity.
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	The analysis utilises data in a way that is consistent with its original purpose. But the data is limited in its usefulness as it cannot inform us of how far a regulatory return on equity may be from investors' required return on equity.
Promote simple over complex approaches where appropriate	Approach involves a simple comparison of transaction value to RAB.
Implemented in accordance with good practice, supported by robust, transparent and replicable analysis that is derived from available credible datasets	Transaction data, trading data, and financial statements are credible and generally available. Analysis would be transparent and repeatable, but there is no accepted method for adjusting or filtering cash flows from unregulated activities or outperformance of regulatory benchmarks.
In relation to models, based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in inputs estimation	Generally not applicable as analysis involves only a simple comparison. There is no accepted method for adjusting or filtering cash flows from unregulated activities or outperformance of regulatory benchmarks.

Criteria	Assessment of relevant material against criteria
In relation to models, based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound rationale	Generally not applicable as analysis involves only a simple comparison. There is no accepted method for adjusting or filtering cash flows from unregulated activities or outperformance of regulatory benchmarks.
Credible and verifiable	Data from transactions and financial statements are credible and verifiable.
Comparable and timely	Transactions for businesses comparable to our benchmark entity are infrequent. Trading data is updated regularly.
Clearly sourced	Transaction data and financial statements are generally well sourced.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate	Approach is not very flexible as new information and changed market conditions are not reflected until a new transaction occurs (or until noise can be distinguished from share trading data).

From this point onwards, we move on to discussing the next step in our process (step three). As per the Guideline, step three is implementing the foundation model. This step requires consideration of a broad range of material to determine the foundation model parameter point estimates that contribute to the achievement of the allowed rate of return objective.

Step three: implementing the foundation model

Based on our assessment under step one and two we adopt the SLCAPM as our foundation model. The input parameters, namely, the risk free rate, MRP and equity beta point estimates that we adopt and the reasons are discussed under this sub section.

Risk free rate

Most approaches to estimating the return on equity require a risk free rate component.[316] This compensates investors for the time value of money. That is, committing funds for a period of time and therefore forgoing the opportunity to immediately spend money or consume goods.[317] For the benchmark efficient entity, we estimate this period of time to be

[316] The majority of financial models proposed by service providers include a risk free rate component. These include the SLCAPM, the Wright approach to the CAPM, the Black CAPM and the FFM. Further, the way service providers apply the DGM incorporates a risk free rate component.

[317] McKenzie, Partington, *Report to the AER: Supplementary report on the equity market risk premium*, 22 February 2012, pp. 11–12.

10 years.[318] We are satisfied that the risk free rate is a suitable starting point of comparison for what other investments must beat, given risk is involved. While the risk free rate varies over time, it still indicates the rate that other investments must beat.

We consider 10 year CGS yields are the most suitable proxy for the risk free rate. CGSs are low default risk securities issued by the Australian Government, and are therefore an appropriate proxy for the risk free rate.[319] The three major credit rating agencies issued their highest possible ratings to the Australian Government.[320] There is broad consensus with this position. For instance, market practitioners widely use CGS yields to proxy the risk free rate.[321] Stakeholders also widely supported using CGS yields as a proxy during the Guideline development process.[322] We use 10 year CGS yields because we adopt a 10 year term. A 10 year term emphasises the long term nature of cash flows in equity investments and the long lived nature the benchmark efficient entity's assets.[323]

We use a risk free rate of 2.55 per cent in this preliminary decision. This risk free rate is based on a 20 business day averaging period, from 9 February 2015 to 6 March 2015. This risk free rate informs the allowed rate of return used to determine the allowed revenues in this preliminary decision, which will be used in setting prices for the 2015–16 regulatory year. This approach is consistent with our letter to Energex on 21 January 2015.[324] Energex accepted this proposed averaging period in its letter dated 29 January 2015.[325]

We will update this risk free rate for the purpose of determining allowed revenues in the revocation and substitution decision. We and Energex have agreed on the averaging period that we will use for calculating the risk free rate in the revocation and substitution determination.[326] When we make this determination on 29 October 2015, we will apply a

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318 AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 48–49.

319 Gregory also identifies the absence of re-investment risk and inflation risk and characteristics of a risk free rate. Gregory, *The risk free rate and the present value principle*, November 2012, p.5. Lally discusses these risks in his report. Lally, *The present value principle*, March 2013, p. 10-12.

320 Standard and Poor's, viewed 5 March 2013, http://www.standardandpoors.com/prot/ratings/entityratings/en/us/?entityID=268976&sectorCode=SOV; Moody's, viewed 5 March 2013, http://www.moodys.com/credit-ratings/Australia-Government-of-credit-rating-75300; Fitch Ratings, viewed 5 March 2013, http://www.fitchratings.com/gws/en/esp/issr/80442187

321 See, for example, Lally, *The present value principle*, March 2013, p. 13, and Wright, *Review of risk free rate and Cost of equity estimates: A comparison of UK approaches with the AER*, October 2012, p. 3; RBA, *Letter regarding the CGS market*, July 2012; Treasury and AOFM, *Letter regarding the CGS Market*, July 2012.

322 For example, see ENA, *Response to the draft guideline*, October 2013, p. 30; APA Group, *Submission on the draft guideline*, October 2013, p. 23-24; NSW DNSPs, *Submission on the draft guideline*, October 2013, p. 18. Spark Infrastructure, *Response to the draft guideline*, October 2013, p. 4.

323 While we recognise there are also reasonable arguments to support using a five year term, we find the arguments for a 10 year term more persuading. For additional reasoning, see AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 48–49.

324 General Manager– AER Networks, *Letter: Rate of return averaging periods for the 2015–20 regulatory control period*, 21 January 2015 (Confidential), p. 2.

325 Group Manager Regulation and Pricing (Energex Ltd), *Letter: Rate of return averaging periods*, 29 January 2015 (Confidential).

326 General Manager– AER Networks, *Letter: Rate of return averaging periods for the 2015–20 regulatory control period*, 21 January 2015 (Confidential), p. 2; Group Manager Regulation and Pricing (Energex Ltd), *Letter: Rate of return averaging periods*, 29 January 2015 (Confidential).

NPV neutral adjustment for any differences between the preliminary and substitute determinations.[327] Consistent with our practice, we will keep the dates of this averaging period confidential until it has expired.

MRP

Under the SLCAPM, the MRP is the premium above the risk free rate an investor would need, in expectation, to invest in the market portfolio. The MRP compensates an investor for the systematic risk of investing in the market portfolio. Systematic risk is that which affects the market as a whole (such as macroeconomic conditions and interest rate risk) and investors cannot diversify it away through investing in a wide pool of firms. The 10 year forward looking MRP cannot be directly observed and there is no consensus amongst experts on which method produces the best estimate of the MRP.[328]

We adopt a point estimate of 6.5 per cent for the MRP for this preliminary decision. This is from a range of 5.1 to 8.6 per cent. We place most reliance on historical excess returns. However, DGM estimates, survey evidence and conditioning variables also inform this estimate. We also have regard to recent decisions by Australian regulators.[329] We consider this approach provides for a return on equity that contributes to the achievement of the allowed rate of return objective and has regard to prevailing conditions in the market for equity funds.[330]

Based on the evidence before us, we consider a range of 5.1 to 8.6 per cent for the MRP under current market conditions (see appendix C–MRP). This is because:

- The geometric average historical excess return currently provides the lowest estimate of the MRP with a range of 3.9 to 4.9 per cent. McKenzie and Partington advised that 'the unbiased estimator of the MRP lies between the arithmetic average and the geometric average'.[331] Therefore, while we have regard to geometric averages, we consider a reasonable estimate of the lower bound will be above the geometric average.[332] Therefore, we apply a lower bound estimate of 5.1 per cent.[333]
- Our DGM currently provides the highest estimate of the MRP at about 8.6 per cent, using the upper bound of our assumptions concerning the long term dividend growth rate.[334] We apply this as the upper bound for the range.

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[327] 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*, November 2012, p. 254.

[328] See Damodaran, *Equity risk premiums: Determinants, estimation and implications— the 2012 edition*, March 2012, p. 93. He also noted: 'No matter what the premium used by an analyst, whether it be 3% or 12%, there is back-up evidence offered that the premium is appropriate'.

[329] AER, *Rate of return guideline*, 17 December 2013, p. 16.

[330] NER, cll. 6.5.2(f–g); NER, cll. 6A.6.2(f–g); NGR, rr. 87(6–7).

[331] McKenzie and Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, p. 5.

[332] AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 83; AER, *Draft decision: SPI Networks access arrangemen*t, September 2012, Appendix B.2.1.

[333] Consistent with the worked example in the Guideline, we set the bottom of the range as 20 basis points above the highest estimate from the range of geometric averages.

[334] As such, this is a conservatively high estimate using our construction of the DGM. This estimate is for the two months ending February 2015.

- We note the upper and lower bound estimates reflect the evidence before us and may change over time. This is consistent with having regard to prevailing conditions in the market for equity funds.[335] The upper bound of the MRP range has increased by 80 basis points since the November 2014 draft decisions. This increase is wholly the result of increased DGM estimates of the MRP.

Given the uncertainty in MRP estimation, we must exercise our regulatory judgement to determine the MRP point estimate from within the range. In deciding upon our point estimate of 6.5 per cent, we have considered the following sources of evidence (see appendix C–MRP):

- Historical excess returns—these estimates provide a range of 5.8 to 6.4 per cent if calculated using arithmetic averages and a range of 3.9 to 4.9 per cent if calculated using geometric averages. We consider 5.1 to 6.5 per cent a reasonable range and 6.0 per cent a reasonable point estimate based on this source of evidence.[336]
- DGMs—these estimates, from two applications of the DGM and a range of inputs, suggest a range of 7.4 to 8.6 per cent for the two months to end February 2015.[337]
- Survey evidence—surveys of market practitioners indicate that MRPs applied in Australia cluster around 6.0 per cent.[338] This holds when considering averages, medians and modes across surveys.
- Conditioning variables—we consider the conditioning variables do not support an increase (or decrease) in the MRP above (or below) that implied by historical excess returns. This is because:[339]
    - Dividend yields are close to their historical averages. These have been relatively steady for over the last 12 months.
    - Australian corporate bond credit spreads have been relatively steady over the past 12 months and now appear to be increasing slightly. The corporate bond spreads are above their pre-2007 levels but the swap spread is below its pre-2007 levels. State government bond spreads appear to have increased slightly over the past 6 months but remain close to their pre-2007 levels.

[335] NER, cll. 6.5.2(g); NER, cll. 6A.6.2(g); NGR, rr. 87(7).

[336] In the worked example in the Guideline, we considered a reasonable MRP range based on historical excess returns evidence was 5.0 to 6.5 per cent, based on geometric mean estimates of 3.6 to 4.8 per cent and arithmetic mean estimates of 5.7 to 6.4 per cent. By setting the upper bound of the historical excess returns range at 6.5 per cent, we fully cover the historical excess returns estimates using arithmetic averages (the highest estimate using arithmetic averages is 6.41 per cent).

[337] This end date is as close as practical to the publication of this decision. This is also close to the end of the averaging period used for the risk free rate (6 March 2015).

[338] 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.

[339] See section C.4 of appendix C–MRP for more information on, and charts of, the conditioning variables. This information is as at 6 March 2015 (except for Australian corporate bond credit spreads, which is as at February 2015).

- Implied volatility suggests the MRP is currently below its historical average level.

- We also have regard to recent decisions among Australian regulators—the majority of other regulators adopted an MRP estimate of 6.0 in their most recent decision or update. The range of MRP estimates adopted by each regulator's most recent decision or update is 6.0 to 7.9 per cent. The average of these decisions is 6.5 per cent.[340]

We have also considered:

- Tribunal decisions—the Tribunal upheld our approach to estimating the MRP when APA GasNet appealed our decision in 2013.[341] The MRP approach brought before the Tribunal was similar to that applied in this decision.[342]
- The potential for a relationship between the risk free rate and the MRP—the evidence has not satisfied us that there is a clear relationship (positive or negative) between the 10 year forward looking risk free rate and MRP.
- Submissions received (from service providers and other stakeholders)—service providers have generally proposed an MRP at or above 6.5 per cent, and other stakeholders have generally recommended an MRP at or below 6.5 per cent.[343]

Figure 3-5 displays our estimates of the MRP using historical excess returns, DGMs, surveys and other regulators' decisions. The squares represent point estimates, the vertical lines represent ranges and the red horizontal line represents our point estimate of 6.5 per cent.[344]

340 In November 2014, the ERA released a revised draft decision of the WACC for regulated rail networks, which adopted an MRP of 7.9 per cent. This forms the top of the range, though we note that the ERA's estimate is based on the Wright approach, which is adopted after consideration of the annuity pricing approach used by the ERA in its rail access regime and which may not be applicable in our case (ERA, *Review of the method for estimating the weighted average cost of capital for the regulated railway networks—Revised draft decision*, 28 November 2014, p. 89). The bottom of the range is 6.0 per cent—the latest estimate of the MRP applied by the ESCV, ESCOSA, NTUC and TER. See: ERA, *Review of the method for estimating the weighted average cost of capital for the regulated railway networks—Revised draft decision*, 28 November 2014, p. 98; ESCV, *Proposed approach to Melbourne Water's 2016 water price review—Consultation paper*, February 2015, p. 39; TER *Draft report: 2015 price determination investigation—Regulated water and sewerage services*, January 2015, p. 41; NTUC, *Network price determination, Part A—Statement of reasons*, April 2014, p. 125; ESCOSA, *SA Water's water and sewerage revenues 2013/14–2015/16: Final determination—Statement of reasons*, May 2013, p. 136.

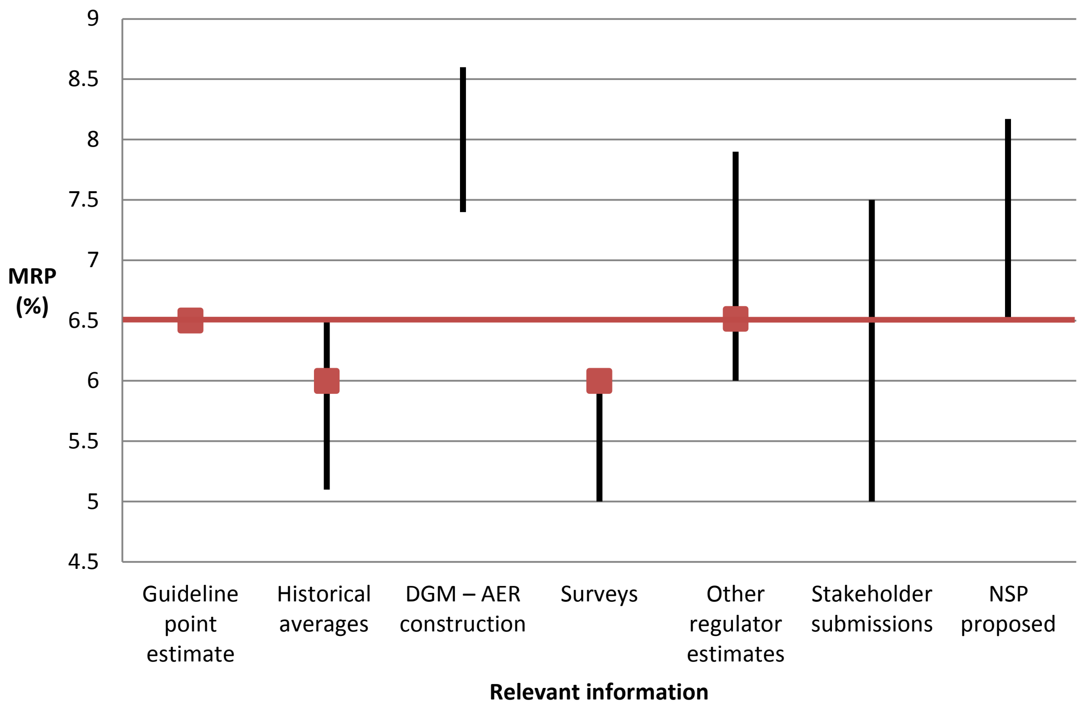
341 Australian Competition Tribunal, *Application by APA GasNet Australia (Operations) Pty Limited (No 2) [2013] ACompT 8*, 18 September 2013, Para 308.

342 The most notable change to our approach is that we now place more reliance on DGMs than using them as a cross check.

343 See discussion under 'Views of service providers and other stakeholders' in section C.8.2 of appendix C–MRP for more information and full reference list.

344 See appendix C–MRP for more information on these sources of information, and the ranges and point estimates we consider are consistent with these sources of information.

Figure 3-5 Empirical estimates of the MRP against our point estimate of 6.5 (per cent)



Source: AER analysis

Note: The average of each state regulator's most recent decision/update on the MRP forms the point estimate (6.5 per cent) for other regulator estimates. In November 2014, the ERA released a revised draft decision of the WACC for regulated rail networks, which adopted an MRP of 7.9 per cent.[345] This forms the top of the other regulator estimates range. The bottom of this range is 6.0 per cent—the latest estimate of the MRP applied by the ESCV, ESCOSA, NTUC and TER.[346] The stakeholder 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 NSPs. The bottom and top of the stakeholder range comes from the CCP and Chamber of Commerce and Industry Queensland (CCIQ) respectively.[347] The bottom of the NSP range comes from TasNetworks and Directlink's revised proposals

345 ERA, *Review of the method for estimating the weighted average cost of capital for the regulated railway networks—Revised draft decision*, 28 November 2014, pp. 89, 98. We note that the ERA's estimate is based on the Wright approach, which is adopted after consideration of the annuity pricing approach used by the ERA in its rail access regime and which may not be applicable in our case.

346 ESCV, *Proposed approach to Melbourne Water's 2016 water price review—Consultation paper*, February 2015, p. 39; TER *Draft report: 2015 price determination investigation—Regulated water and sewerage services*, January 2015, p. 41; NTUC, *Network price determination, Part A—Statement of reasons*, April 2014, p. 125; ESCOSA, *SA Water's water and sewerage revenues 2013/14–2015/16: Final determination—Statement of reasons*, May 2013, p. 136.

347 The CCP submitted we should use an MRP of 5.0 per cent and the CCIQ submitted that we should select an MRP point estimate from a range of 5.0–7.5 per cent. CCP, *Response to AER draft determination for TasNetworks and TasNetworks' revised revenue proposal*, 18 February 2015, p. 4; CCP, *Response to AER draft determination for TransGrid and TransGrid's revised revenue proposal*, 16 February 2015, p. 7; CCP, *Submission: AER draft TransGrid determination TransGrid revised revenue proposal*, 6 February 2015, p. 13; CCP, *Response to AER draft determination for re: ActewAGL regulatory proposal 2014–19*, February 2015, p. 24; CCP, *Submission to AER: Responding to NSW draft determinations and revised proposals from electricity distribution networks*, 2 January 2015, p. 46; CCIQ, *Submission to*

which accept the Guideline approach and our draft decisions.[348] The top of the NSP range comes from Jemena Gas Networks' (JGNs') revised proposal, which applies an MRP of 8.17 per cent.[349]

Figure 3-5 shows that while DGM estimates indicate an MRP above 6.5 per cent, historical excess returns indicate an MRP of around 6.0 per cent. The other evidence we consider is consistent with an MRP of between 6.0 and 6.5 per cent.[350]

We assigned a role to each source of relevant material for estimating the MRP in step two of our foundation model approach. In determining these roles we assessed the merits and limitations of each source. We consider a reasonable application of this material is as follows:

- We place most reliance on historical excess returns. Therefore, we use this information to determine a baseline estimate of the MRP. We consider 6.0 per cent is, at this time, a reasonable point estimate based on this source of evidence.
- We place less reliance on our DGM estimates of the MRP. This information indicates whether we should select an MRP point estimate above or below the baseline estimate.
- We place some reliance on the other information (survey evidence and conditioning variables). This information, in conjunction with DGM evidence, helps to indicate how far above or below the baseline estimate the MRP point estimate should be. We use other Australian regulators' MRP estimates as a cross check on how we consider information.

In applying this approach to the evidence before us for this decision, we consider:

- 6.0 per cent is a reasonable point estimate based on historical excess returns evidence.
- Our DGM estimates (for the two months to end February 2015) range from 7.4 to 8.6 per cent. This indicates that there is evidence, at this time, supporting an MRP point estimate above 6.0 per cent.
- Survey evidence and conditioning variables are consistent with the baseline estimate of 6.0 per cent.
- Since our November 2014 draft decisions, the increase in MRP estimates derived from the DGM has largely been the result of a decrease in the risk free rate. Other inputs to the DGM have remained relatively steady. We are not confident that the recent increases in our DGM estimates of the MRP necessarily reflect an increase in the 'true' expected 10 year forward looking MRP. We detail our reasons below. In summary:
    - We use conditioning variables as a directional indicator for the MRP because of their potential to detect changing market conditions. These indicate either no

Energex's regulatory proposal for 2015–20, 30 January 2015, p. 16; CCIQ, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 20.

[348] TasNetworks, *Revised revenue proposal*, January 2015, p. 5. Directlink, *Revised revenue proposal*, January 2015, p. 11.

[349] JGN, *Revised access arrangement proposal*, February 2015, pp. 30–31.

[350] Figure 3-5 does not include evidence from conditioning variables because we do not derive quantitative estimates of the MRP from this source of evidence. However, we consider the conditioning variables we analyse do not support an increase (or decrease) in the MRP above (or below) that implied by historical excess returns (see appendix C–MRP).

change or an easing in the MRP, which is a different outcome to our DGM estimates of the MRP. We also consider survey evidence provides forward looking estimates of the MRP based on investor expectations.

  - While we consider our DGM is theoretically sound, there are many limitations in practically implementing this model. For example, we consider our, and other, DGMs are likely to produce upward biased estimates of the MRP in the current market.[351] We also consider our, and other, DGMs may not accurately track changes in the return on equity for the market.[352] See section B.5 of appendix B–DGM for a more detailed discussion of sources of potential upward bias in our, and other, DGMs.
  - We do not consider there is a clear relationship (positive or negative) between the 10 year forward looking risk free rate and MRP (see section C.7 of appendix C–MRP). Partington considers it is unlikely that the MRP has increased in response to recent decreases in the risk free rate. He stated '[t]he low bond rates tell us that the required return for low risk assets is low'.[353] This is the benchmark rate against which other risky assets are priced to attract equity funds.

We are satisfied that the information set out above, at this time, could justify an MRP point estimate above the baseline of 6.0 per cent. However, we are not satisfied that it supports an MRP point estimate above the top of the range implied by historical excess returns. Therefore, we are satisfied that an MRP point estimate of 6.5 per cent reasonably reflects prevailing conditions in the market for equity funds and provides for a return on equity that contributes to the achievement of the allowed rate of return objective.[354] It also provides a balance between the views of services providers and other stakeholders. We provide detailed analysis of technical issues and responses to Energex's proposal in appendix C–MRP.

Evidence from other sources of information

We use conditioning variables as a directional indicator for the MRP because of their potential to detect changing market conditions. These do not support the view that the MRP has increased recently. For example:[355]

- Dividend yields have been close to their long term average since approximately April 2013, with no discernible trend (see Figure 3-6).
- Australian corporate bond credit spreads have been relatively steady over the last 12 months and now appear to be increasing slightly. The corporate bond spreads are above their pre-2007 levels but the swap spread is below its pre-2007 levels (see Figure 3-7).

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351 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.

352 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.

353 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 71–74.

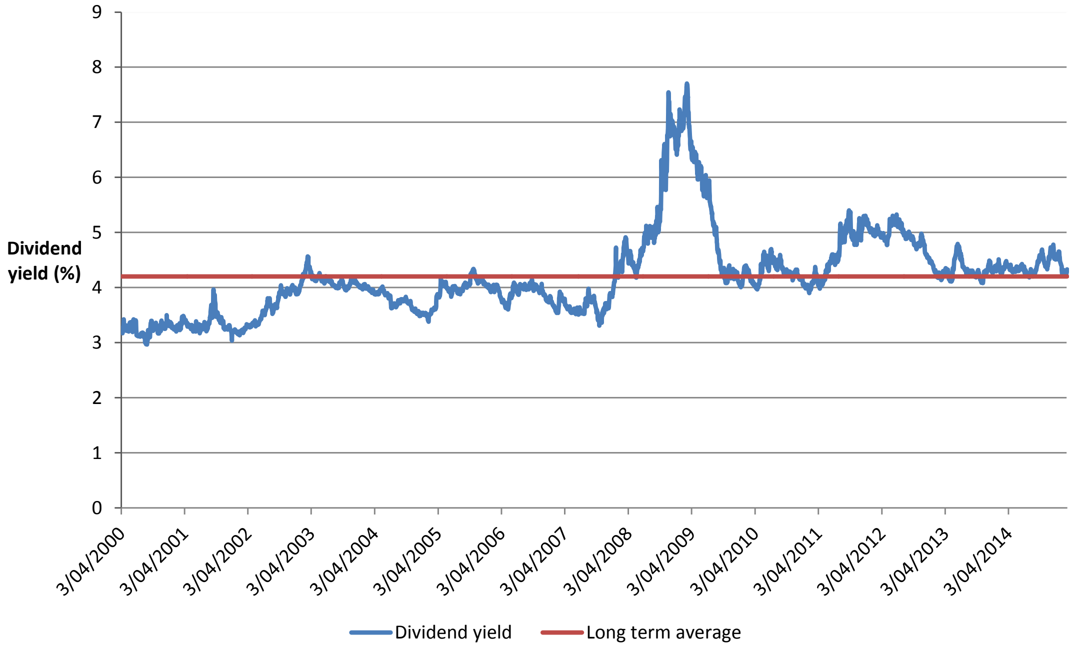
354 NER, cll. 6.5.2(f–g); NER, cll. 6A.6.2(f–g); NGR, rr. 87(6–7).

355 This information is as at 6 March 2015 (except for Australian corporate bond credit spreads, which is as at February 2015).

State government bond spreads appear to have increased slightly over the past 6 months but remain close to their pre-2007 levels (see Figure 3-8).

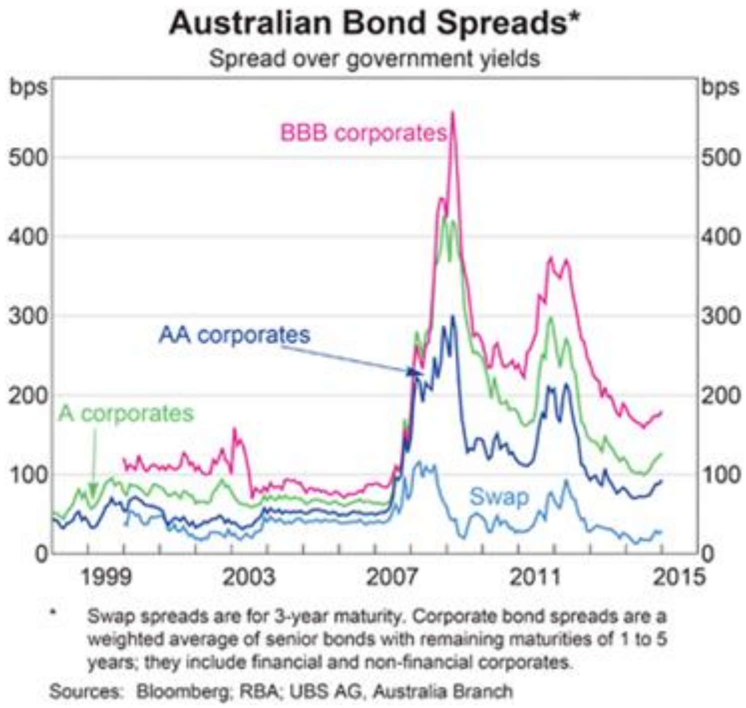
- Implied volatility has generally been below its long term average since around January 2013, with no discernible trend (see Figure 3-9).

Figure 3-6 Dividend yields



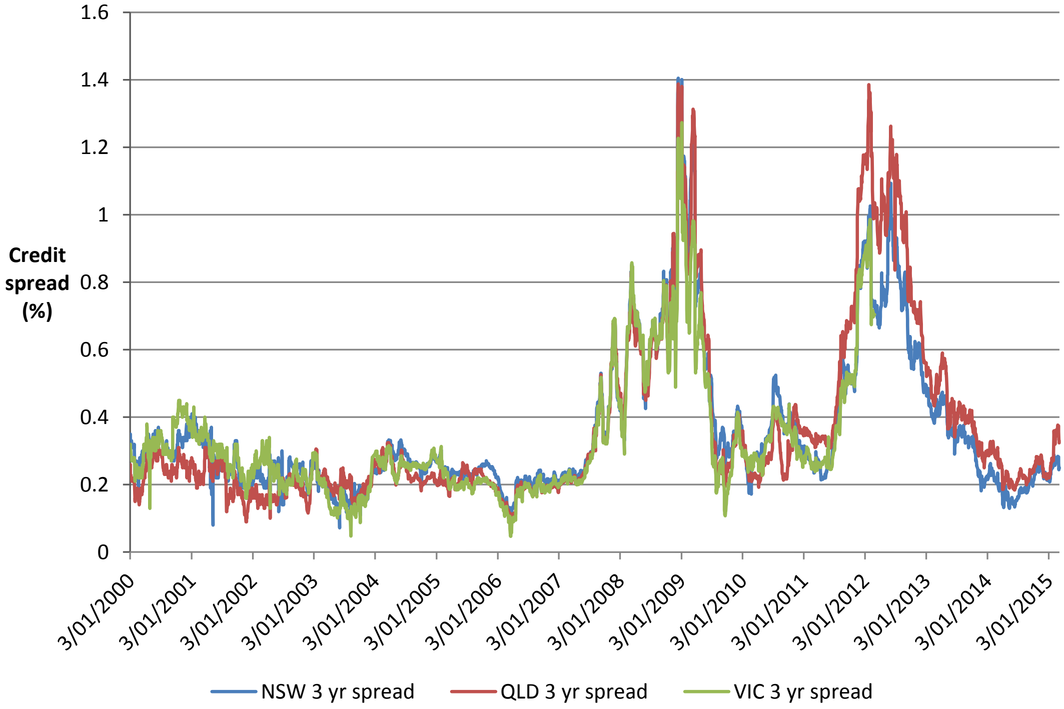
Source: Bloomberg; AER analysis.

Figure 3-7 Australian bond spreads over government yields



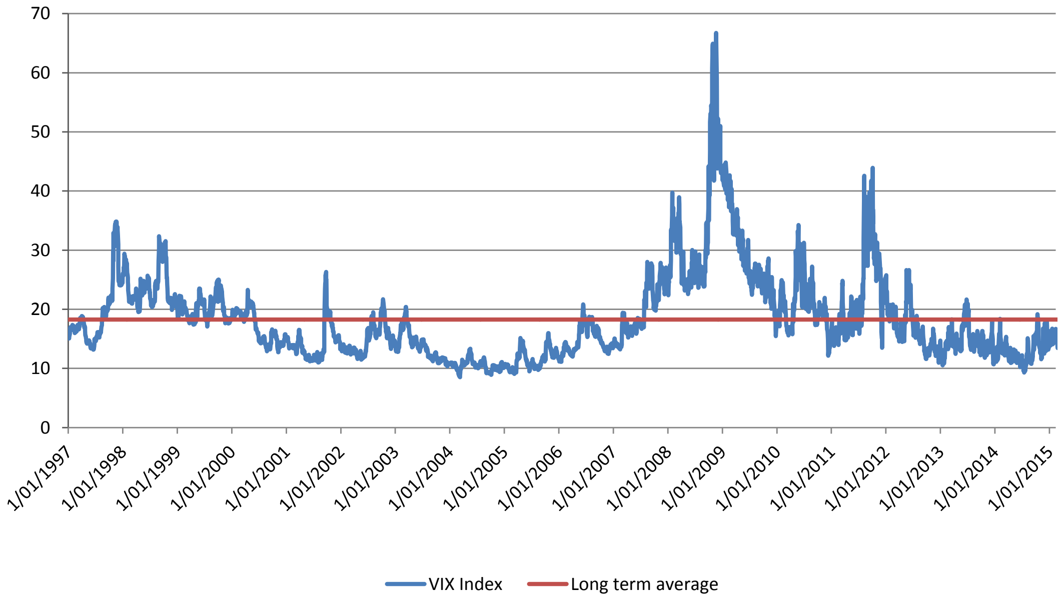
Source: RBA chart pack, February 2015.

Figure 3-8 State government bond spreads over government yields



Source: RBA; AER analysis.

Figure 3-9 Implied volatility (VIX)

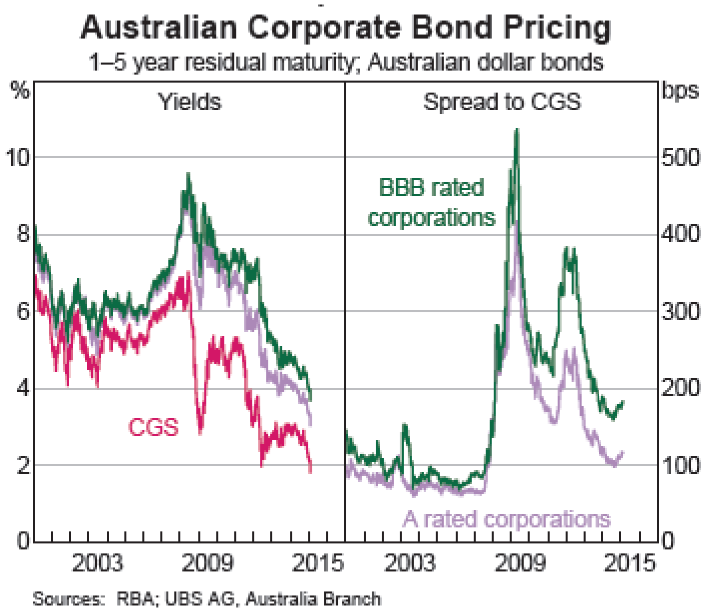


Source: ASX200 VIX volatility index, sourced by Bloomberg cost AS51VIX.

We note similar patterns in other forward looking financial market indicators. For example:[356]

- Figure 3-10 shows that Australian corporate bond yields have decreased significantly since about 2011, moving closely with CGS yields.
- Figure 3-11 shows Australian forward price-earnings ratios since 2003. The RBA, in its statement of monetary policy stated 'valuations of Australian equities, as measured by forward price-earnings ratios, have increased since the previous Statement to be above their decade averages for all sectors'.[357] The RBA also noted that Australian equity prices have increased by 7 per cent since the start of 2015.

Figure 3-10 Australian corporate bond yields and spreads



Source: RBA, *Statement of monetary policy*, February 2015, p. 56.

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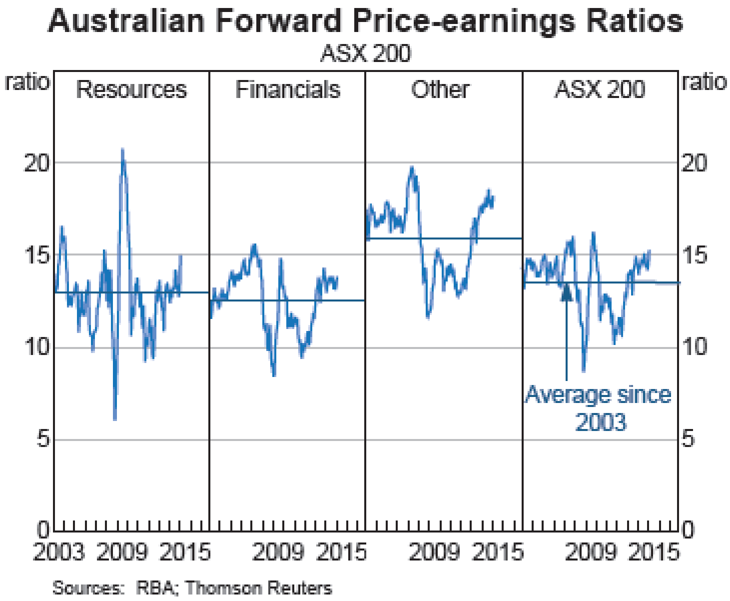
[356] This information is as at February 2015.

[357] RBA, *Statement of monetary policy*, February 2015, p. 59.

Figure 3-11 Australian forward price-earnings ratios



Source: RBA, *Statement of monetary policy*, February 2015, p. 59.

In steps one and two of our foundation model approach, we note DGM estimates can reflect changes in market conditions. We also note conditioning variables have the potential to indicate changes in market conditions, even though it is difficult to derive a specific MRP estimate from this information. These two sources of evidence are not in line with each other.

Similarly, survey estimates of the MRP cluster around 6.0 per cent. We consider survey estimates are forward looking and reflective of investor expectations because they directly ask investors what they expect and/or apply in practice. While we recognise that these estimates have timeliness issues, the most recent (2014) survey does not indicate an increasing MRP expectation (see appendix C–MRP).

Together, the other information we rely on in estimating the MRP is consistent with our baseline estimate of the MRP of 6.0 per cent from historical excess returns. This evidence is not consistent with our DGM estimates of the MRP.

Limitations of DGMs

While we consider our DGM is theoretically sound, there are many limitations in practically implementing this model. We consider our, and other, DGMs are likely to produce upward biased estimates of the MRP in the current market and may not track changes in the return on equity for the market accurately. We discuss these limitations of our, and other, DGMs in detail in section B.5 of appendix B–DGM.

During the Guideline process, McKenzie and Partington and Lally reviewed our DGM construction.[358] Since the Guideline, we have received new advice from McKenzie and Partington and Handley. Both experts reinforced and added to the limitations associated with implementing DGMs.

In their 2014 (and 2015) report, McKenzie and Partington advised that there is a significant risk that DGMs will overestimate the return on equity and hence also overestimate the MRP.[359] They also advised that DGMs may incorrectly track changes in the return on equity.[360] They provided the following reasons for these views:

- Analyst forecasts are well understood to be upward biased.[361]
- DGMs use dividends as a proxy for free cash flow to equity, which is the share of the operating cash flow available for owners.[362] However, there are a number of problems with this approach:
    - Differences between the free cash flow to equity and the dividend in a particular period 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 upward biased DGM estimates of the return of equity.[363]
    - Dividends are a smoothed version of both free cash flow to equity and profits. This is because dividends follow slowly with changes in profits. Therefore, dividends are considered to be 'sticky' and are particularly sticky downwards because companies are more averse to cutting dividends. Thus, if profits and free cash flow to equity drop, and investors revise their growth expectations downwards, the share price may drop significantly without the dividend changing. Together, this will cause a higher dividend yield, giving an upwardly biased estimate of the return on equity. The reverse occurs if profits and free cash flow to equity drop, but McKenzie and Partington consider there is likely to be an asymmetry in the effects because of the greater reluctance to cut dividends than increase dividends.[364]
- Analysts' forecasts are slow to adjust to the information in prices. This, in conjunction with the other limitations set out in this section, means that DGMs may not accurately

358 McKenzie, Partington, *Report to the AER: The Dividend Growth Model (DGM)*, December 2013; Lally, *Review of the AER's Proposed Dividend Growth Model*, December 2013.

359 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 39; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 58–59.

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

361 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; McKenzie and Partington, *The DGM*, December 2013, pp. 8–9.

362 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.

363 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.

364 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.

track changes in the return on equity. McKenzie and Partington caution against relying on month by month, or even year by year, estimates from the DGM. They recommend averaging over several years because it is more likely to reduce measurement error.[365] We note that we average our DGM estimates over two months because we consider longer averaging periods reduce the tracking ability of our DGM. However, we are mindful that our DGM may not be tracking changes in the return on equity for the market accurately.

Further, the risk free rate is currently lower than it has been recently. Our DGM does not include a term structure. This means that at any given point in time, the return on equity for the market is constant for all future periods in the DGM.[366] Lally observed that if DGMs do not incorporate a term structure, they are likely to 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).[367] Lally stated that:[368]

> if the current ten year risk free rate were unusually low relative to its long-term average, and therefore could be expected to be higher in ten years' time, then the current ten-year MRP would have to be unusually high relative to its long-term average by an exactly offsetting amount. This 'perfect-offset' hypothesis is implausible.

McKenzie and Partington also 'recommend that it be borne in mind that the existence of a term structure could materially change cost of equity estimates from the DGM'.[369] We provide reasons for why we do not incorporate a term structure in our DGM in section B.2 of appendix B–DGM. However, we are aware of this potential bias.

We consider there are merits associated with DGM estimates of the MRP, particularly in their ability to reflect changes in market conditions (which complements our use of historical excess returns). However, it is important to be aware of the limitations associated with these estimates.

Potential relationships between the MRP and risk free rate

The evidence has not satisfied us that there is a clear relationship (positive or negative) between the risk free rate and MRP (see section C.7 of appendix C–MRP for a more detailed discussion). In his 2015 report, Partington supported our view.[370]

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365 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; McKenzie and Partington, *The DGM*, December 2013, pp. 8–9.

366 This means, at a given point in time, there is a uniform expectation of the return on equity across all periods in the DGM. However, this uniform expectation can change as one moves through time, because factors such as dividend forecasts, share prices or the expected growth rate in GDP can change over time. Therefore, when estimating the return on equity for the market at any given point in time, our DGM assumes that this estimate applies to all future periods. However, this does not mean our DGM always produces the same return on equity estimates for the market.

367 Lally, *Review of the AER's Proposed Dividend Growth Model*, December 2013, pp. 11–12.

368 Lally, *Review of the AER's Proposed Dividend Growth Model*, December 2013, pp. 11–12.

369 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.

370 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 71–74.

In their 2013 report, McKenzie and Partington undertook a comprehensive literature review and found there is evidence that supports both a positive and negative relationship.[371] McKenzie and Partington also found there was some support in the literature for an oscillating relationship (that is, the relationship is at times positive and at other times negative).

We note that a common view among service providers is that periods of low interest rates are a result of a 'flight to quality' by investors. This is usually associated with a view that there is increased risk aversion across the economy and therefore an increased MRP expected by investors. However, in his 2015 report, Partington advised that periods of low interest rates can also cause investors to engage in a 'search for yield'.[372] He stated:[373]

> There is also a widespread view that investors are engaged in a “search for yield”. This “search for yield” story has two versions. In both versions investors are taking on extra risk. The first version is that the low return on debt is causing investors to switch into shares with high dividend yields, resulting in a price premium for such shares. The second version is that in a search for higher yields investors are more willing to take on riskier investments. In other words, they are accepting a lower risk premium.

Moreover, current market evidence does not appear to be consistent with the view that there a widespread 'flight to quality' among investors. This can be seen in our consideration of conditioning variables and survey evidence. For example, during the GFC (where there might have been periods of widespread 'flight to quality') we saw a:

- decrease in CGS yields[374]
- sharp increases in conditioning variables; dividend yields, credit spreads and implied volatility (see Figure 3-6 to Figure 3-9).

However, over the past 12 months, we have seen a:

- decrease in CGS yields[375]
- limited movement in conditioning variables, which have remained fairly steady and close to their long term averages (see Figure 3-6 to Figure 3-9).

Partington considered that 'that the general and very substantial decline in credit spreads since the GFC seems inconsistent with increasing risk aversion'.[376] Partington also noted that we should be cautious in using this evidence to infer a decrease in the MRP.[377] This is

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371 McKenzie and Partington, *Review of the AER’s overall approach to the risk free rate and market risk premium*, February 2013, pp. 6, 24.

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

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

374 See CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 23 (figure 5).

375 See CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 23 (figure 5).

376 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 73.

377 Partington however noted that in previous regulatory determinations, regulated businesses and their consultants were arguing for a high equity risk premium because credit spreads were high as a consequence of GFC. See: Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 73–74.

because movements in the credit spread may not necessarily have direct parallels in movements of the equity risk premium.

We are not satisfied that there is a clear relationship (positive or negative) between the risk free rate and MRP. We are not satisfied that there is evidence of a widespread 'flight to quality' among investors in current market conditions. In fact, there is evidence to suggest investors may also be engaging in a 'search for yield', which is not consistent with an increase in the MRP. Partington considers it is unlikely that the MRP has increased in response to recent decreases in the risk free rate. He stated '[t]he low bond rates tell us that the required return for low risk assets is low'.[378] This is the benchmark rate against which other risky assets are priced to attract equity funds.

Equity beta

The equity beta is a key input parameter in our foundation model, the SLCAPM. It measures the sensitivity of an asset or business's returns to the movements in the overall market returns (systematic or market risk).[379] Because the SLCAPM works on the basis that investors can diversify away business–specific risk, only systematic (non-diversifiable) risk is relevant for determining the equity beta.[380]

We adopt an equity beta point estimate of 0.7 from a range of 0.4 to 0.7 for a benchmark efficient entity. We are satisfied that an equity beta of 0.7 is reflective of the systematic risk a benchmark efficient entity is exposed to in providing regulated services.[381]

We estimate the range for the equity beta based on empirical analysis using a set of Australian energy network firms we consider reasonably comparable to a benchmark efficient entity. For this analysis we commissioned an expert report from Professor Olan Henry (Henry), which uses recent data up to 28 June 2013.[382] This 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, comparator sets 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, as set out in Table 3-18 at the end of this section.[383]

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

379 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.

380 McKenzie and Partington, *Risk, asset pricing models and WACC*, June 2013, pp. 21–22;

381 NER, cl. 6.5.2(c); NER, cl. 6A.6.2(c); NGR, r. 87(3).

382 Henry uses data from 29 May 1992 to 28 June 2013. See: Henry, *Estimating β: An update*, April 2014, p. 9. We consider the results of this report in detail (see section D.2.3 of appendix D) because they are more likely to be reflective of prevailing market conditions.

383 As discussed in detail in section D.2.2 of appendix D, 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 prone to measurement error. See: Henry, *Estimating β: an update*, April 2014, p. 52.

This empirical range is consistent with our conceptual analysis, which we use to cross check our empirical results. This is because our conceptual analysis suggests the systematic risk of a benchmark efficient entity would be less than the systematic risk of a market average entity (that is, less than 1.0). Our conceptual analysis is supported by McKenzie and Partington in their 2014 and 2015 reports.[384]

We consider the evidence in Henry's 2014 report suggests a best empirical estimate for the equity beta of approximately 0.5.[385] However, there are additional considerations that inform our determination of the equity beta point estimate from within the range. In particular, we consider the following sources of additional information:

- Empirical estimates of international energy networks—the recent international empirical estimates we consider range from 0.3 to 1.0.[386] The pattern of international results is not consistent and there are inherent uncertainties when relating foreign estimates to Australian conditions. However, we consider international empirical estimates provide some limited support for an equity beta point estimate towards the upper end of our range. More information on international empirical estimates can be found in section D.3 of appendix D–equity beta.
- The theoretical principles underpinning the Black CAPM—the Black CAPM relaxes an assumption underlying the SLCAPM, which allows for unlimited borrowing and lending at the risk free rate.[387] For firms with an equity beta below 1.0, the Black CAPM theory may support a higher return on equity than the SLCAPM. We consider this information points to the selection of an equity beta point estimate above the best empirical estimate implied from Henry’s 2014 report. However, we do not consider the theory underlying the Black CAPM warrants a specific uplift or adjustment to the equity beta point estimate.[388] The theory underlying the Black CAPM is qualitative in nature, and we consider this information is reasonably consistent with an equity beta point estimate towards the upper end of our range. More information on the theory underlying the Black CAPM can be found in section D.4 of appendix D–equity beta.

Further, we are mindful of the importance of providing stakeholders with certainty and predictability in our rate of return decisions, which we consider is consistent with the

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384 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 31. This report is an update to: McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 10–12.

385 We consider most of the equity beta estimates from Henry’s 2014 report are clustered around 0.5 (see section D.2.3 of appendix D). In forming this view, we consider averages of individual firm estimates and fixed weight portfolio estimates.

386 See section D.3 of appendix D for more information. The lower bound reflects the estimates presented in the Alberta Utility Commission's (AUC's) 2013 Generic Cost of Capital report (published March 2015) and the upper bound reflects an average of the Brattle Group’s estimates for three US energy network firms. See: AUC, *2013 Generic Cost of Capital*, 23 March 2015, pp. 24–26; The Brattle Group, *The WACC for the Dutch TSOs, DSOs, water companies and the Dutch pilotage organisation*, March 2013, p. 16. The upper bound of this range increases to 1.3 if we consider the additional Damodaran estimates SFG submitted in its 2015 report (see section D.3 of appendix D).

387 However, the Black CAPM replaces this assumption with an allowance for unlimited short selling of stocks.

388 Also, we do not consider our use of this information implies there is bias in the return on equity estimates derived from the SLCAPM. Our view is supported by McKenzie and Partington and Handley in their 2014 and 2015 reports. See: McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 23. Handley, *Advice on the return on equity*, October 2014, pp. 10-–12; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 41–44; Handley, *Further advice in the return on equity*, April 2015, pp. 5–6.

achievement of the allowed rate of return objective. The Guideline was developed, in part, to provide regulatory certainty for stakeholders under the new rules framework, and allow for our decisions to be reasonably predictable. It was also developed following consultation and analysis. The AEMC and stakeholder submissions to the 2012 rule change process accepted these views.[389] The final Guideline expanded on the draft Guideline to include input parameter estimates for our foundation model as of December 2013. We did this in response to submissions from stakeholders, particularly service providers, seeking greater certainty of process.[390]

After taking these considerations into account, we adopt an equity beta point estimate of 0.7 for this preliminary decision, consistent with the Guideline. We consider this approach is reflective of the available evidence, and has the advantage of providing a certain and predictable outcome for investors and other stakeholders. We recognise the other information we consider does not specifically indicate an equity beta at the top of our range. However, a point estimate of 0.7 is consistent with these sources of information and is a modest step down from our previous regulatory determinations.[391] It also recognises the uncertainty inherent in estimating unobservable parameters, such as the equity beta for a benchmark efficient entity.

Moreover, we consider an equity beta point estimate of 0.7 provides a balance between the views of consumer groups and service providers. While many stakeholder submissions supported the application of the approach set out in the Guideline, the CCP and a number of other stakeholders consider our equity beta point estimate was set too high.[392] For example, UnitingCare Australia submitted that:[393]

> As with MRP, we believe that the range in values for β lie on a continuum between low figures that serve the best interests of consumers, and higher figures that will serve the best interests of investors and owners, but that will come at the expense of affordability. Again, we recommend the AER act in the best interests of consumers and select at the lower end of the range. Such a choice would be consistent with

389 AEMC, *Final rule determination*, November 2012, pp. 42–43, 45, 50. Additional support for these views were provided in stakeholder submissions on the Guideline material. See: 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.

390 AER, *Explanatory statement: Rate of return guideline*, December 2013, p. 51.

391 Since 2010, 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.

392 CCP, *Response to AER draft determination for TasNetworks and TasNetworks' revised revenue proposal*, 18 February 2015, p. 4; CCP, *Response to AER draft determination for TransGrid and TransGrid's revised revenue proposal*, 16 February 2015, p. 7; CCP, *Submission: AER draft TransGrid determination TransGrid revised revenue proposal*, 6 February 2015, p. 13; CCP, *Response to AER draft determination for re: ActewAGL regulatory proposal 2014–19*, February 2015, p. 24; CCP, *Submission to AER: Responding to NSW draft determinations and revised proposals from electricity distribution networks*, 2 January 2015, p. 46. Refer to section D.5.2 of appendix D for a full list of stakeholder submissions supporting an equity beta lower than 0.7 for the benchmark efficient entity. While some of these are not submissions to Energex's proposal, we have a common framework for estimating the return on equity for a benchmark efficient entity. Therefore, we consider all stakeholder submissions when determining the equity beta estimate for each service provider.

393 UnitingCare, *Submission to SA Power Networks' regulatory proposal for 2015–20*, February 2015, p. 33.

relatively low risk businesses in a relatively benign capital market, which is the current situation.

Conversely, Energex submitted that our equity beta point estimate of 0.7 is too low.[394] Energex proposed an alternative 'foundation model' approach applied by SFG to estimate the return on equity.[395] In applying this approach, SFG first adopted an equity beta estimate of 0.82 for the SLCAPM, based on a comparator set of both Australian and US energy firms. Then, it used return on equity estimates from the Black CAPM, FFM and SFG's construction of the DGM to reverse engineer three implied equity beta estimates for the SLCAPM. Finally, SFG took a weighted average of the four equity beta estimates to derive a 'composite foundation model equity beta' estimate of 0.91.[396]

We consider an equity beta of 0.7 for the benchmark efficient entity is reflective of the systematic risk a benchmark efficient entity is exposed to in providing regulated services.[397] In determining this point estimate, we applied our regulatory judgement while having regard to all sources of relevant material and using that material in a manner consistent with its relative merits. We do not rely solely on empirical evidence and we do not make a specific adjustment to equity beta to correct for any perceived biases in the SLCAPM. We also do not rely on empirical evidence from the Black CAPM, FFM or SFG's construction of the DGM (see appendix A–equity models and appendix B–DGM). We do not consider our use of the SLCAPM as the foundation model will result in a downward biased estimate of the return on equity for a benchmark efficient entity (see section A.3.1 of appendix A–equity models).

Our equity beta point estimate provides a balanced outcome, given the submissions by stakeholders and services providers. Figure 3-12 shows our equity beta point estimate and range in comparison with other reports and submissions. We are satisfied this outcome contributes to the achievement of the allowed rate of return objective, and is consistent with the NEO and RPP.[398] We provide a detailed analysis of technical issues and responses to Energex's proposal in appendix D–equity beta.

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394 Energex, *Regulatory proposal*, October 2014, pp. 163–165.

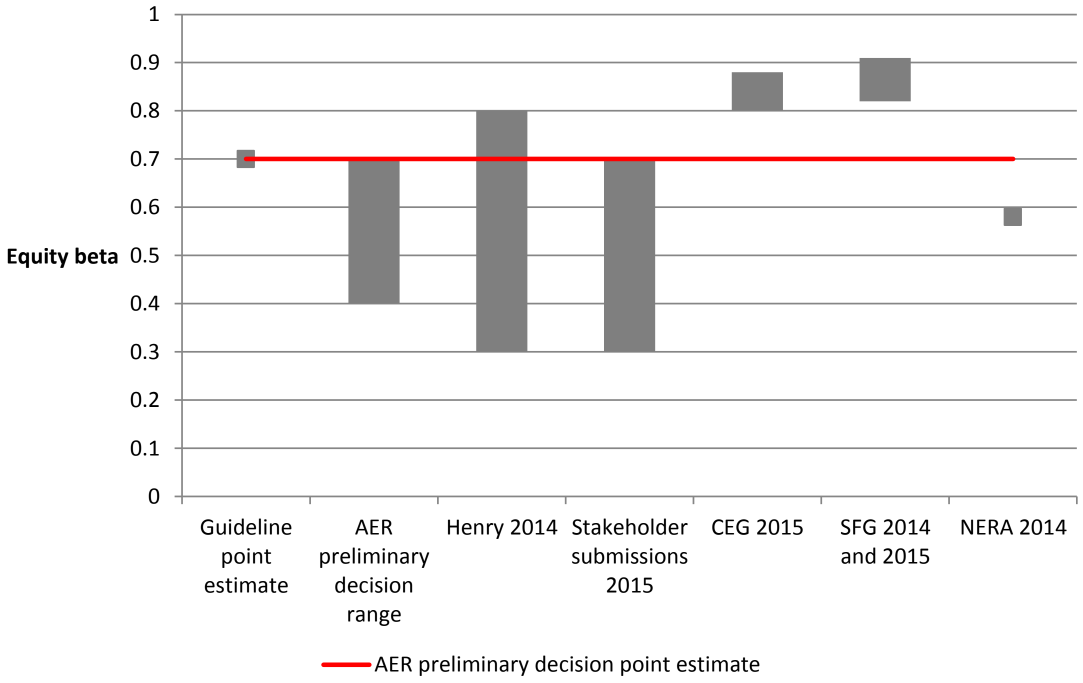
395 SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 79, 83–89 (attachment 39 to Energex's proposal); SFG, *The required return on equity: Initial review of the AER draft decision—Report for Energex*, 30 January 2015, pp. 44–45 (submitted during the period for submissions). However, during the period for submissions, Energex also submitted SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 32–33, 35. In this report, SFG submitted that, under our foundation model approach, we should use empirical evidence from the Black CAPM to inform the equity beta for the SLCAPM. It did not refer to the FFM or SFG's DGM. Although, the composite equity beta estimates are the same (0.91), this approach appears inconsistent with the approach set out in Energex's proposal.

396 SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 89; SFG, *The required return on equity: Initial review of the AER draft decision—Report for Energex*, 30 January 2015, p. 45.

397 This benchmark efficient entity operates in Australia, by our definition. For this reason (and other reasons discussed in step two of this section and section D.2.1 of appendix D), we do not give a determinative role to international empirical estimates of equity beta.

398 NER, cl. 6.5.2(c) and 6A.6.2(c); NEL, sections 7 and 7A. NGR, r. 87(3); NGL, sections 23 and 24.

Figure 3-12 Submissions on the value of the equity beta



Source: AER analysis[399]

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 Alliance of Electricity Consumers' submission and the upper bound is based on Origin's submissions. The CEG 2015 range is based on adjustments to SFG's regression based estimates for the mining boom. The SFG 2014 and 2015 range lower bound is based on SFG'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's multiple model based equity beta estimates (under its alternative 'foundation model' approaches for the return on equity). The NERA 2014 point estimate is based on an equity beta of 0.58, which NERA used for its preferred specification of the SLCAPM (although NERA uses multiple models to estimate the return on equity).

399 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; Alliance of Electricity Consumers, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 6; Origin, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 17; Origin, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2015, p. 13; Origin, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 15; NERA, *Return on capital of a regulated electricity network*, May 2014, p. 79; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 57–58. SFG submitted 0.82 (under multiple model approach for return on equity) in SFG, *Equity beta*, May 2014, p. 41; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 28; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 85; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 20; SFG, *The required return on equity for the benchmark efficient entity*, 12 March 2015, p. 20; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 4. SFG submitted 0.91 (under alternative 'foundation model' approaches for return on equity) in SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 96; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 88; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 35.

Table 3-18 Equity beta estimates for Australian energy network firms

Source	Time period	Individual firm averages	Fixed portfolios	Varying portfolios[a]	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			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		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		0.55	OLS regressions, four weekly repeat sampling, Vasicek adjustment, re-levered estimates, 9 comparators
ERA 2012	2002–2011	0.44–0.60			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		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]		daily/weekly/monthly return intervals, discrete/continuous returns, various estimation

Source	Time period	Individual firm averages	Fixed portfolios	Varying portfolios[a]	Summary of regression permutations
					periods, OLS/LAD regressions, value/equal weight portfolios, raw/re-levered estimates, no adjustment/Vasicek/Blume, 10 comparators
ACG 2002	2000–2002[f]	0.61–0.69			monthly return intervals, OLS regressions, raw/re-levered estimates (with varying debt betas), 4 comparators

Source: AER analysis.[400]

(a) As discussed in section D.2.2 of appendix D, 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.

(b) 0.31 is a raw LAD estimate, which we place less reliance on (see section D.2.2 of appendix D). 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.

Step four: other information

In this section, we discuss the estimates of the return on equity we derive from the other information.

400 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, *Draft 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.

Our foundation model equity risk premium estimate of 4.55 per cent is within the range of premiums estimated by independent valuers (3.3 to 6.2 per cent), brokers (2.6 to 6.0 per cent), and other regulators (3.3 to 12.3 per cent).

Table 3-19 Range of estimates from other information

	Return on equity		Equity risk premium	
	Minimum	Maximum	Minimum	Maximum
AER foundation model	4.6	8.6	2.0	6.1
Wright approach CAPM	5.5	9.7	3.0	7.1
Independent valuation reports	7.5	14.7	3.3	11.7
Broker reports	6.9	12.0	2.6	6.0
Other regulators' decisions	6.5	15.6	3.3	12.3

Source: AER analysis (see Appendices E.1 through E.5 for further detail).

We estimate the return on equity under the Wright approach using a range for the long term historical average return on the market and a range for equity beta. The estimated return on the market will vary depending on the time period used.[401] Our range of equity beta estimates is discussed in step three. Using only the beta point estimate from the top of the range (0.7), return on equity estimates fall within a range of 7.8 to 9.7 per cent.

We have focused on independent valuation reports, broker reports, and other regulators' decisions that include a return on equity for businesses that provide the closest comparison to our benchmark efficient entity. For this reason, we note that the lower end of the other regulators' decisions range is likely more comparable to the benchmark efficient entity.[402] We have 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.

We do not consider the adjustments that valuers apply to uplift discount rate estimates to address perceived risks relevant to the valuation task are consistent with the allowed rate of return objective. The upper bound shown in Table 3-19 above includes these uplifts, the lower bound excludes uplifts. We therefore consider the lower end of the valuation report range would better contribute to the achievement of the allowed rate of return objective. We also note that the number of relevant reports is too low and the concentration of reports

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

402 Due to the inclusion of regulatory decisions on rail networks that may have significantly different risk characteristics than the benchmark efficient entity. In the case of the ERA's November 2014 , *Review of the method for estimating the WACC for the Regulated Railway Networks — Revised draft decision*, the annuity approach adopted in the rail access arrangements in the context of the Western Australian rail access regime are a factor in the decision to use the Wright approach to determine market risk premium. See Appendix E.5 for more detail.

among only a few valuers is too high to be able to place significant reliance on the directional evidence from valuation reports.[403]

In addition to return on equity estimates, we have also considered the return on debt relative to our foundation model return on equity estimate. The current debt market is indicating a premium over the risk free rate of 1.9 per cent.[404] 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), as shown in Figure 3-13.

We do not consider that the current difference of about 260 basis points between the equity risk premium allowed in our preliminary decision and current debt risk premiums[405] to be too low, on the basis of:

- the low risk nature of our benchmark efficient entity (as outlined in step two)
- the current stabilising of debt risk premiums after a recent downward trend
- 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.[406]

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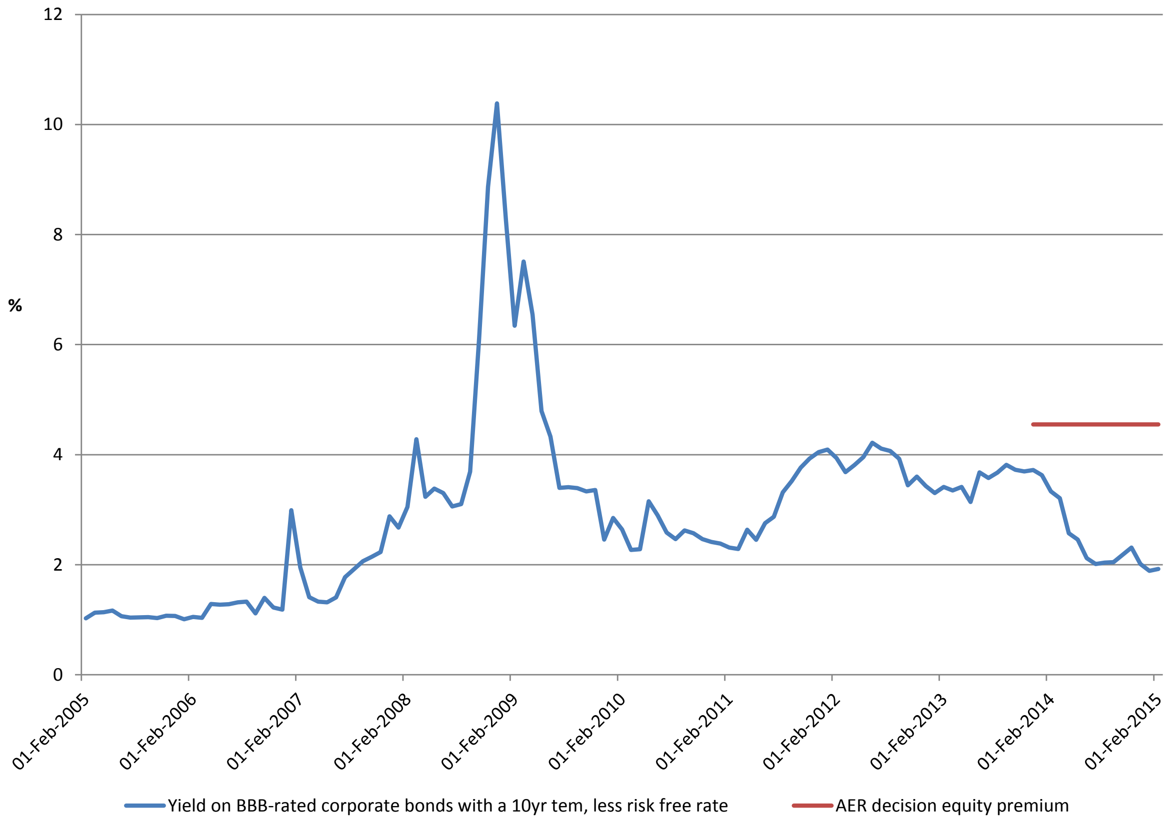
403 This position was also supported by Partington, who stated "We do not consider that expert reports should be used to directly estimate the cost of equity for regulated entities. This is because the sample size of reports for utilities is very small and the risk of idiosyncratic variation is high." [Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 69].

404 Based on the RBA's monthly data (statistical table F3) for the 28 February 2015 on yield to maturity on BBB-rated corporate bonds with a ten year term, specifically, the spread to CGS. RBA corporate bond data used for comparative purpose only. This is not reflective of our preliminary decision return on debt estimate which is calculated as an average of the RBA and Bloomberg (BVAL) data series and estimated by reference to BBB+ rated corporate bonds. In our preliminary decision we also make an extrapolation adjustment to the RBA data series.

405 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.

406 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.

Figure 3-13 Comparison of equity and debt premiums



Source: AER analysis, RBA F3 and F16 interest rates statistics

Our assessment of other information is discussed further in appendix E.

Step five: evaluate information set

We are satisfied that an expected return on equity estimate derived from the SLCAPM should be our starting point (foundation model). We consider there is overwhelming evidence that the SLCAPM is the current standard bearer for estimating expected equity returns. We are not satisfied that the NSPs' proposed construction of other equity models, as well as proposed application of quantitative and qualitative methods to give weight to these models, will result in a return on equity that contributes to achievement of the allowed rate of return objective.[407] We are not (in principle) averse to a multi model approach where the models are equally valid for the intended objective.[408] 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. We disagree with the NSPs that to have regard to other models means they

407 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].

408 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.

must be applied. Given the limitations (as outlined in step two) of the other equity models proposed by the NSPs, 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 to specifying the SLCAPM, the DGM, 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 SLCAPM input parameters (Black CAPM and DGM).[409]
- The FFM and historical specification of the SLCAPM should not be used to inform our return on equity estimate in any capacity.

Beyond models for estimating a return on equity, there is also other material that we consider useful for informing our return on equity estimate. We agree with the NSPs' and CCP's proposals that the prevailing return on debt and return on equity estimates from other market practitioners (brokers, independent valuers, and other regulators) should be considered, but we disagree with their views as to the reliance they should be accorded.

Our foundation model return on equity estimate is 7.1 per cent, based on a prevailing risk free rate, a MRP estimate of 6.5 per cent, and an equity beta estimate of 0.7.[410] The estimate is calculated as follows:

$$7.1\% = 2.55\% + 0.7 * 6.5\%$$

We consider that this estimate is broadly supported by the other information set out in step four. In coming to this conclusion, without underplaying the importance of all of the relevant information, the key influential factors are:

- The regulatory regime to date has been utilising the SLCAPM to set the return on equity and has been supportive of investment. The NSPs we regulate have been able to raise capital to undertake extensive investment programs.[411] This suggests the allowances set in the past using the SLCAPM were at least adequate to recover efficient costs.[412] This provides confidence that our estimate for this preliminary decision, while taking account of the downward trends in equity beta and current market conditions (for the risk free rate and MRP), is likely to provide Energex with a reasonable opportunity to recover at least efficient costs.[413]

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409 We note that our specification of these models (particularly the DGM) may differ from that proposed by the NSPs.

410 For more information on how we came to these estimates, see step three.

411 Since 2008, the transmission and distribution NSPs across the national electricity market have invested in the order of $6 billion per year in capital expenditure (capex).This is a high level estimate that does not include the gas networks that we regulate.

412 This position was supported in submissions (on a concurrent determination process) from EMRF and PIAC – see: Energy Markets Reform Forum*, Australian Energy Regulator - NSW Electricity Distribution Revenue Reset - AER Draft Decision and Revised Proposals from Ausgrid, Endeavour Energy, and Essential Energy, A response by EMRF*, February 2015, pp. 27–28; Public Interest Advocacy Centre, *A Missed Opportunity?* Submission to the Australian Energy Regulator's Draft Determination for Ausgrid, Endeavour Energy, and Essential Energy, February 2015, p. 39.

413 Our previous decision for Energex in May 2010 adopted an equity risk premium of 6.0 per cent [AER, *Final Decision: Queensland distribution determination 2010–11 to 2014–15*, 28 May 2010]. Our previous Rate of Return Guideline,

- Our foundation model return on equity estimate is approximately 260 basis points above the prevailing yield-to-maturity on BBB-rated debt with a 10 year term-to-maturity. The return on debt is a relative indicator; we expect that most of the time investors' expected return on equity will exceed the expected return on debt. For a benchmark efficient entity with a similar degree of risk as Energex, we would not expect the return on equity to be a long way above the prevailing return on debt.[414] On this basis, the promised return on debt material does not support any change to our foundation model return on equity estimate.
- Our foundation model return on equity estimate falls within the range of estimates derived from the Wright approach. Using the beta range and data up to the 2014 calendar year end, Wright approach return on equity estimates range from 5.5 to 9.7 per cent. This results in an equity risk premium range of 3.0 to 7.1 per cent. Using only the beta point estimate from the top of the range, return on equity estimates range from 7.8 to 9.7 per cent. We estimate the return on equity under the Wright approach using a range for the long term historical average return on the market. We use a range because the estimated return on the market will vary depending on the time period used.[415]
- Our foundation model equity risk premium estimate of 4.55 per cent is within the range of premiums estimated by independent valuers (3.3 to 6.2 per cent), brokers (2.6 to 6.0 per cent), and other regulators (3.3 to 12.3 per cent). We do not consider the adjustments that Grant Samuel undertook to uplift its discount rate estimates to address perceived risks relevant to its valuation task, are consistent with the allowed rate of return objective.[416]

In summary, the information indicates that our equity risk premium of 4.55 per cent falls within the range of other indicators available to inform the return on equity. Our task is to set the allowed rate of return to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to Energex in respect of the provision of standard control services.[417] Hence, the critical allowance for an equity investor in a benchmark efficient entity is the allowed equity risk premium over and above the estimated risk free rate at a given time. Under the application of the standard

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released in May 2009, adopted an equity risk premium of 5.2 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]. Our most recent final decisions (excluding transitional decisions) for any electricity or gas service provider were in 2013 and adopted an equity risk premium of 5.2 per cent for ElectraNet and 4.8 per cent for Victorian gas network service providers [AER, *Final Decision: ElectraNet Transmission Determination 2013–14 to 2017–18*, 30 April 2013, p. 24; AER, *Access Arrangement Final Decision*, Multinet Gas (DB No. 1) Pty Ltd, Multinet Gas (DB No. 2) Pty Ltd, 2013–17, Part 2: Attachments, 15 March 2013, p. 143.]. This preliminary decision adopts an equity risk premium of 4.55 per cent, which is consistent with our 2013 Rate of Return Guideline.

414 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 step 2.

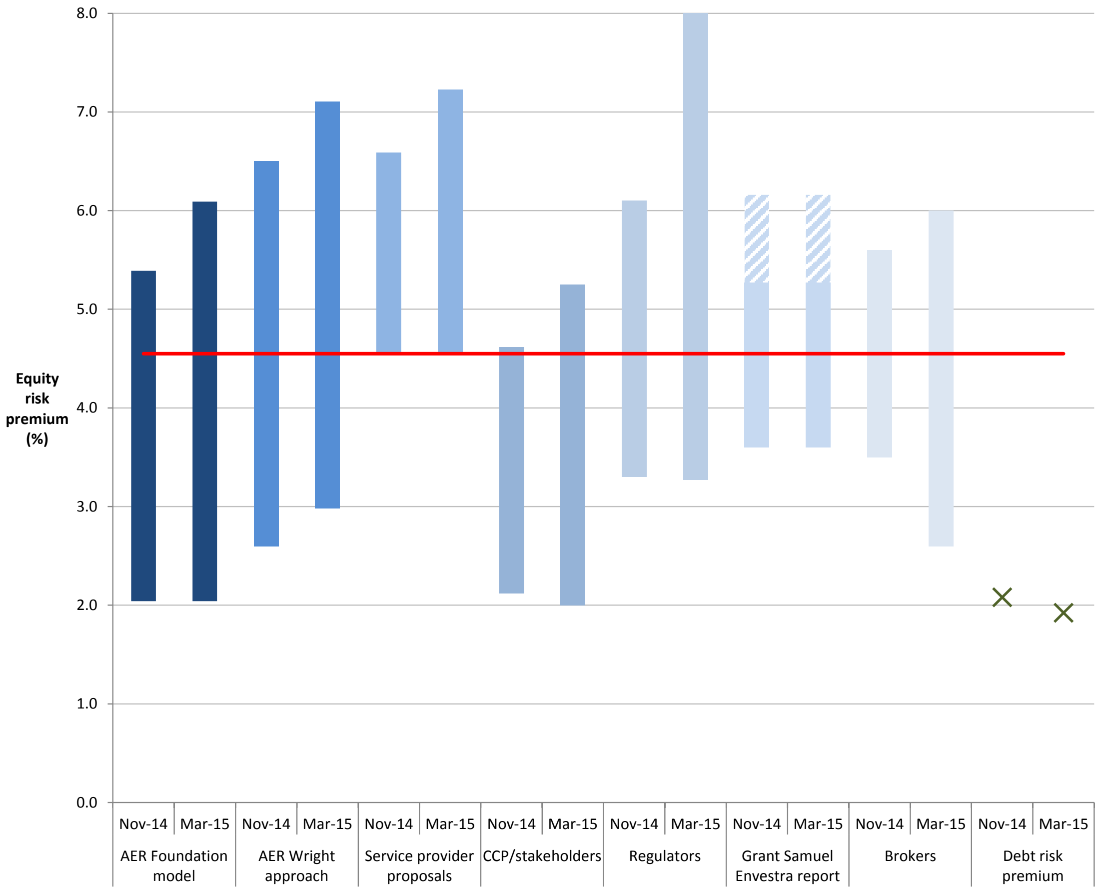
415 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 26–27.

416 See Appendix E.6. 'Return on equity estimates from other practitioners' for more detail.

417 While there may be many various risks associated with providing regulated network 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.

SLCAPM, this equals the MRP multiplied by the equity beta. We also consider the relative values of the equity risk premium and the debt risk premium of the benchmark efficient entity. Figure 3-14 shows this comparison and our point estimate.

Figure 3-14 Equity risk premium comparison



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 MRP and equity beta as set out in step three. The calculation of the Wright approach, debt premium, brokers, and other regulators ranges is outlined in Appendices E.1, E.2, E.4, and E.5 respectively.

Grant Samuel's final WACC range included an uplift above an initial SLCAPM range. The lower bound of the Grant Samuel range shown above excludes the uplift while the upper bound includes the uplift and is on the basis that it is an uplift to return on equity. Grant Samuel made no explicit allowance for the impact of Australia's dividend imputation system. We are uncertain as to the extent of any dividend imputation adjustment that should be applied to estimates from other market practitioners. Accordingly, the upper bound of the range shown above includes 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.[418]

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

The service provider proposals range is based on the proposals from businesses for which we are making final or preliminary decisions in April–May 2015.[419] Equity risk premiums were calculated as the proposed return on equity less the risk free rate utilised in the service provider's proposed estimation approach.

The CCP/stakeholder range is based on submissions made (not including service providers) in relation to our final or preliminary decisions in April–May 2015. The lower bound is based on the Energy Users Association of Australia submission on NSW distributors' revised proposals. The upper bound is based on Origin's submission on ActewAGL's proposal.[420]

A number of the equity risk premium ranges shown in Figure 3-14 have moved since our November 2014 draft decisions. We note that:

- The widening of our foundation model range is due to the increase in our DGM estimate of the MRP. The widening of the regulators range is in the first instance due to changes in the composition of the regulated businesses. Recent decisions for rail networks have increased the range, but rail networks are unlikely to be comparable to the benchmark efficient entity.[421] Excluding the rail decisions, the widening of the range is then due IPART's February 2015 biannual WACC update, which places significant reliance on DGM estimates of MRP. As discussed in step three, we place less reliance on the DGM estimates of MPR than estimates from historical excess returns.
- The increase in the service providers' proposed range is due to the lower risk free rate estimate used in revised model estimates. As discussed in step two, we consider that the service providers' proposed models are not sufficiently reliable and do not produce results that would contribute to the achievement of the allowed rate of return objective.
- The upwards shift in the range from the Wright approach is caused by the decline in the risk free rate from November 2014 to March 2015.[422] We note that there is no clear evidence of a relationship between risk free rate and equity risk premium.[423]
- The range of equity risk premium estimates from broker reports for listed service providers has widened asymmetrically, with the mid-point of the range declining.
- Debt risk premiums (spread between BBB+ rated corporate debt and the risk free rate) have not materially changed.
- In addition to the equity risk premium ranges shown in Figure 3-14, we have analysed movements in credit spreads, dividend yields, and the volatility index for the ASX200.[424]

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419 ActewAGL, Ausgrid, Directlink, Endeavour Energy, Energex, Ergon Energy, Essential Energy, Jemena Gas Networks, SA Power Networks, TasNetworks, and TransGrid.

420 Energy Users Association of Australia, *Submission to NSW DNSP Revised Revenue Proposal to AER Draft Determination (2014 to 2019)*, February 2015, pp. 15–16; Origin Energy, *Submission to ActewAGL's regulatory proposal for 2014–19*, August 2014, p. 4.

421 See Appendix E.5. for more detail.

422 We updated our estimate of the historical market return to the 2014 calendar year end from the 2013 calendar year end used in our November 2014 draft decisions. This (on its own) had the effect of decreasing the upper bound of the Wright approach ERP range by 10 basis points, with no change to the lower bound. Therefore, the increase in the Wright approach range from our November 2014 draft decisions is wholly due to the decrease in the risk free rate over that time.

423 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.

424 See appendix C.4 for further discussion.

> These conditioning variables can provide information about prevailing market conditions and whether or not the market is in a period of heightened risk aversion. Movements in these conditioning variables since our November 2014 draft decisions have not been material.[425]

This information does not support the view that risk premiums have increased since our November 2014 draft decisions and we do not consider that there is sufficient evidence to cause us to move away from our foundation model estimate. Having considered the overall information and material before us, at this time we are not satisfied that this new information indicates a departure from our November 2014 draft decisions or from the guideline would contribute to the achievement of the allowed rate of return objective. We think the importance placed by all stakeholders on predictability and certainty of the guideline is important to contribute to the achievement of the allowed rate of return objective.[426]

Next, recognising that there is no one precise estimate, we exercise our regulatory judgment. We look at all the evidence to determine whether we should adopt our foundation model point estimate as the return on equity estimate that we are satisfied will contribute to the achievement of the allowed rate of return objective.

Step six: distil point estimate

We are satisfied that an expected return on equity derived from the SLCAPM should be the starting point for estimating the return on equity. We are also satisfied that the other information does not indicate that our equity risk premium estimate should be uplifted or downshifted to better contribute to the achievement of the allowed rate of return objective.

Following our estimation approach and having considered and given the relevant material due weight on their merits, we are satisfied that an expected return on equity estimate of 7.1 per cent derived from our implementation of the SLCAPM will contribute to the achievement of the allowed rate of return objective. We are also satisfied that this estimate is consistent with prevailing market conditions.

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425 Relative to long term trends.

426 We received many stakeholder submissions supporting our guideline approach including: AGL, Submission on NSW DNSPs draft decision, 15 February 2015; Australian PV Institute, Submission on Energex's regulatory proposal 2015-20, 30 January 2015; Consumer Challenge Panel, Submission on draft decision and revised regulatory proposal, 23 February 2015; COTA, Submission on Energex's regulatory proposal 2015-20, 30 January 2015; Cotton Australia, Submission on Qld distributors' regulatory proposals 2015-20, 30 January 2015; Energy Consumers Coalition of South Australia, Submission on SAPN's regulatory proposal 2015-20, 31 January 2015; Energy Users Association of Australia, Submission on SAPN's regulatory proposal 2015-20, 30 January 2015; Energy Markets Reform Forum, Submission on NSW DNSPs draft decision and revised proposals, 16 February 2015; Origin Energy, Submission on draft decision and revised regulatory proposal, 13 February 2015; Public Interest Advocacy Centre, Submission on NSW DNSPs draft decisions, 13 February 2015; Queensland Council of Social Service, Submission on Qld distributors' regulatory proposals 2015-20, 30 January 2015; SA Council of Social Services, Submission on SAPN's regulatory proposal 2015-20, 30 January 2015; SA Financial Counsellors Australia Consortium, Submission on SAPN's regulatory proposal 2015-20, 30 January 2015 and UnitingCare Australia, Submission on SAPN's regulatory proposal 2015-20, 13 March 2015.

3.4.2 Return on debt

The return on debt provides a service provider with an allowance to cover borrowing costs to fund investment in its network. Consistent with other elements of the rate of return, we estimate the return on debt based on the efficient financing costs of a 'benchmark efficient entity', rather than based on the actual financing costs of the service provider.

Our preliminary decision is to adopt a return on debt of 5.01 per cent, rather than the 5.91 per cent (indicative rate) proposed by Energex. This return on debt will apply to Energex for 2015–16. We will update a portion of this return on debt (10 per cent) each year based on the prevailing return on debt over the 2015–20 period. This preliminary decision sets out both how we have arrived at this rate for 2015–16, and also how we plan to update this rate annually.

Our preliminary decision on the return on debt approach is:

- to use a ‘trailing average portfolio approach’—that is, to estimate the average return that would have been required by debt investors in a benchmark efficient entity if it raised debt over an historical period prior to the commencement of a regulatory year in the regulatory control period
- to update the return on debt estimate annually (that is, for each regulatory year)
- to apply equal weights to all the elements of the trailing average, and
- to implement transitional arrangements—in moving from the current ‘on the day’ approach to the new ‘trailing averaging portfolio’ approach—based on the 'QTC method' (an annual re-pricing of a portion of the notional debt portfolio) and a benchmark term of 10 years.

Our preliminary decision on the implementation of the return on debt approach is:

- to use a benchmark credit rating of BBB+
- to use a benchmark term of debt of 10 years
- to use an independent third party data series to estimate the return on debt, and
- to use an averaging period for each regulatory year of 10 or more consecutive business days up to a maximum of 12 months, where the averaging period is as close as practical to the commencement of each regulatory year and is also consistent with other conditions we proposed in the rate of return guideline.[427]

The above positions are consistent with the return on debt approach and implementation we proposed in the Guideline.[428] Accordingly, our preliminary decision is to maintain the return on debt methodology we proposed in the Guideline.

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[427] AER, *Rate of return guideline*, December 2013, pp.21-22; AER, *Explanatory statement—Rate of return guideline*, December 2013, p.126.

[428] AER, *Rate of return guideline*, December 2013, pp.18-20; AER, *Explanatory statement—Rate of return guideline*, December 2013, p.98; AER, *Rate of return guideline*, December 2013, pp.21-22; AER, *Explanatory statement—Rate of return guideline*, December 2013, p.126.

In the Guideline, we proposed to use one or more third party data series to estimate of the return on debt.[429] However, at that time we had not formed a view on which data series to use. In April 2014, we released an issues paper setting out our considerations in making this choice and sought submissions from service providers. We have now formed a position on this issue. Our preliminary decision is to use a simple average of:

- the RBA broad-BBB rated 10 year curve (the RBA curve),[430] and
- where available, the Bloomberg broad-BBB rated 7 year BVAL curve (the BVAL curve), otherwise the Bloomberg broad-BBB rated 5 year BVAL curve.[431]

Further, our preliminary 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 Energex's averaging periods.[432]

Our preliminary decision is to transition the benchmark efficient entity gradually into the new trailing average portfolio approach. We start by estimating the return on debt in a similar way to the previous regulatory approach, which was called the 'on the day' approach. This rate is applied to the first regulatory year. From there, we update 10 per cent of the return on debt each year based on the prevailing rate in that year over the service provider's averaging period. After the 10 year transition period is complete the allowed return on debt fully reflects a 10 year trailing average. The length of the transition period is determined by the benchmark term of debt, which is 10 years.

The prevailing return on debt is different to the historical return on debt averaged over the last 10 years. Accordingly, whether or not transitional arrangements are applied makes an impact on the building block revenue service providers may recover, and ultimately, on the network prices paid by consumers. The prevailing return on debt is lower than the historical average, meaning whether or not transitional arrangements are applied has a material impact on service providers' revenues and consumer prices. However, it could have been the case that the prevailing return on debt was higher than the historical average. Our consideration of transitional arrangements in this decision is on a principled basis and would reflect our considerations whether the prevailing return on debt was higher or lower than the 10 year historical average.

In the following sections, we explain our key reasons for adopting the positions outlined above. We also respond to the key issues raised by Energex, other service providers with current proposals, and consumer representatives on the return on debt. In appendices G to J we provide further supporting material for these positions and we also respond to the issues

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429 AER, *Explanatory statement—Rate of return guideline*, December 2013, pp. 23–24.

430 The RBA refers to this curve as 'Non-financial corporate BBB-rated bonds'.

431 The Bloomberg ticker for this curve is: BVCSAB07.

432 For the RBA curve, our draft decision is to interpolate the monthly data points to produce daily estimates, to extrapolate it to an effective term of 10 years, and to convert it to an effective annual rate. For the BVAL curve, our draft decision is to extrapolate it to 10 years using the spread between the extrapolated RBA 7 and 10 year curves, and to convert it to an effective annual rate.

raised by stakeholders in more detail. Finally, in appendix K, we assess Energex's proposed averaging periods to estimate the return on debt.[433]

For the reasons set out in this attachment, appendices G to K, we are satisfied that our preliminary decision on the return on debt:

- is commensurate with the efficient debt financing costs of a benchmark efficient entity with a similar degree of risk as which applies to Energex in respect of the provision of regulated services. Accordingly, we are satisfied that this return on debt contributes towards the achievement of the rate of return objective.
- is consistent with the national electricity objective and the revenue and pricing principles, including providing Energex with a reasonable opportunity to recover at least its efficient costs, and

enables the revenue change resulting from the annual debt update process to be effected through the automatic application of a formula that is specified in the determination.

Legislative framework for return on debt estimation

In determining the rate of return and return on debt, we must follow requirements in both the National Electricity Law (NEL) and National Electricity Rules (NER).

Requirements of the law

Under the NEL, the AER must determine the rate of return in a manner that will or is likely to contribute to the achievement of the national electricity objective (NEO).[434]

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:

- price, quality, safety, reliability and security of supply of electricity, and
- the reliability, safety and security of the national electricity system.[435]

The AER must also take into account the revenue and pricing principles when determining the rate of return.[436]

Of particular relevance to the rate of return are the following revenue and pricing principles:

- A regulated network service provider should be provided with a reasonable opportunity to recover at least the efficient costs the operator incurs in:
    - providing regulated network services, and

433 Appendix K is confidential. Consistent with our standard practice, we will keep the service provider's averaging periods confidential until they expire.
434 NEL, s.16(1).
435 NEL, s. 7.
436 NEL, s.16(2).

  - complying with a regulatory obligation or requirement or making a regulatory payment.
- A regulated network service provider should be provided with effective incentives in order to promote economic efficiency with respect to regulated network services the operator provides. The economic efficiency that should be promoted includes:
  - efficient investment in a distribution system or transmission system with which the operator provides regulated network services; and
  - the efficient provision of electricity network services; and
  - the efficient use of the distribution system or transmission system with which the operator provides regulated network services.
- A price or charge for the provision of a regulated network service should allow for a return commensurate with the regulatory and commercial risks involved in providing the regulated control network service to which that price or charge relates.
- Regard should be had to the economic costs and risks of the potential for under and over investment by a regulated network service provider in, as the case requires, a distribution system or transmission system with which the operator provides regulated network services.
- Regard should be had to the economic costs and risks of the potential for under and over utilisation of a distribution system or transmission system with which a regulated network service provider provides regulated network services.[437]

Requirements of the rules

The National Electricity Rules (NER) require that the return on debt for a regulatory year must be estimated such that it contributes to the achievement of the allowed rate of return objective.[438] That objective is 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.[439]

The return on debt may be estimated using a method that results in either:

- the return on debt being the same for each regulatory year in the regulatory control period, or
- the return on debt being, or potentially being, different for different regulatory years in the regulatory control period.[440]

437 NEL, s.7A.
438 NER, cl.6.5.2(h) and cl.6A.6.2(h).
439 NER, cl.6.5.2(c) and cl.6A.6.2(c).
440 NER, cl.6.5.2(i) and cl.6A.6.2(i).

Our preliminary decision on the return on debt method results in the return on debt being, or potentially being, different for different regulatory years. All service providers with current regulatory proposals proposed such a method for estimating the return on debt.

Subject to the allowed rate of return objective, the NER state that the method adopted to estimate the return on debt may, without limitation, be designed to result in the return on debt reflecting:

- the return that would be required by debt investors in a benchmark efficient entity if it raised debt at the time or shortly before the making of the determination for the regulatory control period
- the average return that would have been required by debt investors in a benchmark efficient entity if it raised debt over an historical period prior to the commencement of a regulatory year in the regulatory control period, or
- some combination of the above.[441]

The NER require that we must have regard to the following factors in estimating the return on debt:[442]

- The desirability of minimising any difference between the return on debt and the return on debt of a benchmark efficient entity (as referred to in the allowed rate of return objective).[443] We interpret this factor to mean the difference between the return on debt allowance the AER sets (the *allowed return on debt*) and the cost of debt a benchmark efficient entity would actually incur (the *actual return on debt*). For clarity, we do not consider this factor relates to minimising the difference between the return on debt 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.[444]
- 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.[445]
- Any impacts (including in relation to the costs of servicing debt across the 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.[446]

The last factor is particularly relevant to the current decisions because both our final decision method and the method proposed by Energex are a change from the method used to

441 NER, cl. 6.5.2(j) and cl. 6A.6.2(j).
442 NER, cl.6.5.2(k) and cl.6A.6.2(k).
443 NER, cl.6.5.2(k)(1) and cl.6A.6.2(k)(1).
444 NER, cl.6.5.2(k)(2) and cl.6A.6.2(k)(2).
445 NER, cl.6.5.2(k)(3) and cl.6A.6.2(k)(3).
446 NER, cl.6.5.2(k)(4) and cl.6A.6.2(k)(4).

estimate the return on debt in the previous regulatory control period.[447] In its final rule determination which led to the current return on debt provisions in the NER, the Australian Energy Market Commission (AEMC) stated:

> The purpose [of this factor] … is for the regulator to have regard to the 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 significant and unexpected change in costs or prices that may have negative effects on confidence in the predictability of the regulatory arrangements.[448]

The AEMC further stated:

> Its purpose is to allow consideration of transitional strategies so that any significant costs and practical difficulties in moving from one approach to another is taken into account.[449]

The NER refer to 'any' impacts on a benchmark efficient entity as a result of changing the return on debt methodology. The NER then give an example of one impact—the cost of servicing debt across regulatory periods. Accordingly, the NER specifically give an example where it is appropriate to take a perspective across more than one regulatory period. We consider another impact is the impact on whether a benchmark efficient entity remains able to recover its efficient financing costs over the life of its assets, in light of changing the methodology for estimating the return on debt. In other words, we have considered whether the change in methodology could result in a benchmark efficient entity being over or under compensated over the life of its assets. This is consistent with the NPV principle. We discuss this principle further later in this attachment.

Also, if the return on debt method results in an estimate that is, or could be, different for different regulatory years, then the NER require the resulting change to the service provider’s regulated revenue must be effected through the automatic application of a formula that is specified in the determination.[450]

Return on debt—Approach

Our preliminary 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 (2015-16) of the 2015–20 period, and

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447 Our previous decisions covered the 2009–14 regulatory control period for Ausgrid, Essential Energy, Endeavour Energy, ActewAGL, TasNetworks (Transend) and TransGrid, the 2006–15 regulatory control period for Directlink, and the 2010–15 access arrangement period for JGN.

448 AEMC, *Final rule change determination*, 29 November 2012, p. 85.

449 AEMC, *Final rule change determination*, 29 November 2012, p. 85.

450 NER, cl.6.5.2(l) and cl. 6A.6.2(l).

- gradually transition this rate into a trailing average approach (that is, a moving historical average) over 10 years.[451]

This means for the 2015–16 regulatory year, the return on debt is based on prevailing interest rates before the start of the 2015–20 period (specifically, it is based on prevailing interest rates during Energex's debt averaging period). For subsequent regulatory years, the gradual transition will occur through updating 10 per cent of the return on debt each year to reflect prevailing interest rates (during Energex's debt averaging periods) in each year.

In practical terms, our return on debt approach means that an on-the-day rate shortly before the start of the 2015–20 period is applied to:

- 100 per cent of the debt portfolio for the 2015–16 regulatory year
- 90 per cent of the debt portfolio for the 2016–17 regulatory year, with the remaining 10 per cent based on prevailing interest rates during Energex's averaging period for 2016–17
- 80 per cent of the debt portfolio for the 2017–18 regulatory year, with 10 per cent based on prevailing interest rates during Energex's averaging period for 2016–17, and 10 per cent based on prevailing interest rates during Energex's averaging period for 2017–18, 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 Energex's averaging periods over the previous 10 years.

Consistent with the NER requirement, this annual update will be effected through the automatic application of the return on debt methodology we set out in this decision.[452]

This debt approach is consistent with the approach we proposed in the Guideline. In the Guideline, we based our transition on the approach recommended by the Queensland Treasury Corporation (QTC).[453] We refer to this as 'the QTC approach'.

In our current determination processes, the issue of how to move from the previous on-the-day approach to the new trailing average approach is contentious and material.

Service providers have a mixed position on how to make this change:

- TasNetworks, Queensland service providers (Energex and Ergon Energy), and AusNet Services Group service providers agreed with the QTC approach we adopted in the Guideline.[454]

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[451] This preliminary decision determines the return on debt methodology for the 2015–20 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.

[452] NER, cl. 6.5.2(l); NER, cl. 6A.6.2(l).

[453] QTC, *Moving average approach–Detailed design issues*, 8 June 2012.

- CKI Group service providers (Citipower, Powercor and SAPN), Jemena Group service providers (JEN and JGN) and United Energy/Multinet also agreed on applying a transition. Initially, CKI and Jemena Group service providers agreed with the QTC approach we adopted in the Guideline.[455] Now, they and United Energy/Multinet have proposed a different form of transition.[456]
- NSW service providers (TransGrid, Ausgrid, Endeavour Energy, Essential Energy), ActewAGL and Directlink disagree with the QTC approach and proposed we use a backwards looking trailing average approach with no transition.[457]

Generally, energy retailers, major energy users, small consumer representatives and the Consumer Challenge Panel (CCP) support our approach of moving from the on-the-day approach to the trailing average approach.

How we move from the on-the-day approach to the trailing average approach affects the revenue that service providers may recover from consumers, and the network prices consumers pay.

Prevailing interest rates are currently lower than the historical average of interest rates over the past 10 years. Equally, prevailing interest rates could have been higher than the historical average. Our consideration of how to determine the return on debt is based on well-established economic, financial and regulatory principles and would reflect our position whether prevailing interest rates were higher or lower than the 10 year historical average.

This is the first decision where we are moving away from the on-the-day approach. Therefore, the on-the-day approach was the regulatory regime in place when a 'benchmark efficient entity' previously issued its existing debt. Practically, this means it was also the regulatory regime in place when actual service providers previously issued their existing debt.

The effect of our transition is that the trailing average approach is applied to all new debt issued by a benchmark efficient entity. And the on-the-day approach continues to apply to all existing debt until it is matured.

For example, for debt that a benchmark efficient entity issued in 2010, it will continue to pay interest on that debt until 2019 (as the benchmark term is debt is 10 years). When this debt was issued in 2010, the regulatory regime was the on-the-day approach, and a benchmark efficient entity would have reasonably expected that to remain the regulatory regime into the future. Accordingly, we continue to provide a return on debt allowance with respect to that

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454 TasNetworks, *Revised proposal*, January 2015, p.5; Energex, *Initial proposal*, October 2014, p.167; Ergon Energy, *Initial proposal*, October 2014, p.123; and AusNet Services, *Submission on draft rate of return guideline*, October 2013, p.3.

455 SAPN, *Initial proposal*, October 2014, pp.338–339; JGN, *Initial proposal–Access arrangement information–Appendix 9.10*, June 2014, p.14;

456 Citipower and Powercor, *Submission on first round of regulatory determinations under the new rules*, February 2015, section 4; SAPN, *Submission on SAPN issues paper*, January 2015, pp.8–10; JGN, *Revised proposal–Access arrangement information*, February 2015, p.21; and United Energy/Multinet, *Submission on first round of regulatory determinations under the new rules*, February 2015, pp.11–14.

457 TransGrid, *Revised proposal*, January 2015, pp.118–125; Ausgrid, *Revised proposal*, February 2015, pp.179–187; ActewAGL, *Revised proposal*, February 2015, p.427,473; and Directlink, *Revised proposal*, January 2015, pp.12–13.

existing debt in accordance with the on-the-day regulatory regime. For debt that a benchmark efficient entity would issue in 2016, this will be after we have changed the regulatory approach and commenced the transition to the trailing average approach. Accordingly, the trailing average approach will be applied to this new debt.

We are satisfied our return on debt approach contributes to the achievement of the NEO, the allowed rate of return objective and is consistent with the revenue and pricing principles. This is because it:

- Incorporates principles of incentive based regulation whereby service providers bear the outcomes (both positive and negative) of the decisions they make to match or move away from the regulatory benchmark. In this context, service providers determine their chosen risk strategies for their financing arrangements with an understanding that they will bear the outcomes that flow from those choices.
- Provides a benchmark efficient entity with a reasonable opportunity to recover at least the efficient financing costs it incurs in financing its assets. And as a result it:
  - promotes efficient investment, and
  - promotes consumers not paying more than necessary for a safe and reliable network.
- Avoids a bias in regulatory decision making that can arise from the selection of historical data after the results of that data is already known.
- Avoids practical problems with the use of historical data as estimating the return on debt during the global financial crisis is a difficult and contentious exercise.

We explain these reasons further in our April 2015 final decisions for the NSW service providers.

Annual updates to the return on debt

Our preliminary decision is to update the return on debt each year. This position is consistent with our approach proposed in the Guideline.[458] All service providers with current regulatory proposals also proposed to update annually the return on debt. We agree with this component of their proposals.

The NER states that the return on debt may be estimated using a methodology which results in either:

- the return on debt for each regulatory year of the regulatory control period being the same, or
- 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.[459]

458 AER, *Explanatory statement—rate of return guideline*, December 2013, pp. 111–15.

459 NER, cl.6.5.2(i) and cl.6A.6.2(i).

Annually updating is a methodology which results in the return on debt being, or potentially being, different for different regulatory years.

We are satisfied that annual updates contribute towards the achievement of the allowed rate of return objective. This is because annual updates:

- reduce the potential mismatch between the allowed return on debt and the actual cost of debt of a benchmark efficient entity, and
- reduce the potential for large price shocks or volatility for consumers between regulatory control periods (by introducing a smaller degree of price volatility within the regulatory control period).

By the end of the Guideline development, the majority of stakeholders (including both service providers and consumer representatives) supported updating the return on debt each year.[460]

As set out in the explanatory statement to the Guideline, we acknowledge the implementation of annual updates would be moderately complex. The NER require the change in revenue from the annual debt update to be effected through the automatic application of formula that is specified in a service provider's determination.[461] To facilitate the requirement for automatic updating, our decision is to:

- Use a third party data provider to estimate the allowed return on debt. Our decision on the choice of third party data provider is set out later in this attachment.
- Require service providers to nominate averaging periods for each regulatory year upfront in their regulatory proposals (rather than during the regulatory control period). Our decision on averaging periods and the annual update process is set out later in this attachment.
- Implement the annual updates in accordance with the process for annual updating set out in the handbook to the post-tax revenue model.[462]

As set out in the explanatory statement to the Guideline, we consider the advantages of annual updates outweigh the resource requirement and other potential disadvantages (such as potentially higher price volatility in a regulatory control period).[463] At this point in time, we maintain that view. However, this position is premised on our decision to adopt a third party data series and to require service providers to nominate averaging periods upfront.

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460 Consumer representatives such as COSBOA, EUAA and MEU supported annual updating. Service providers (and their representatives) such as APA Group, the ENA, Envestra, Ergon Energy, QTC and AusNet Services supported annual updating. On the other hand, consumer representatives such as the NSW Irrigators' Council did not support annual updating, and PIAC did not express a strong preference either way. See AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2014, p. 196.

461 NER, cl.6.5.2(l) and cl. 6A.6.2(l).

462 AER, *Final decision—Amendment—Electricity transmission network service providers—Post-tax revenue model handbook*, January 2015, pp.34-35; AER, *Final decision—Amendment—Electricity distribution network service providers—Post-tax revenue model handbook*, January 2015, pp.39-40.

463 AER*, Explanatory statement—rate of return guideline*, December 2013, pp. 111–15.

The CCP disagrees with our adoption of a third party data series, and instead considers we should use actual debt costs such as constructing our own index of actual industry borrowing costs. ActewAGL disagrees with our requirement for service providers to nominate averaging periods upfront. Instead, it proposes to introduce a new annual process to nominate and assess averaging periods for the next year. We do not agree with the CCP's or ActewAGL's proposals for the reasons set out later in this attachment and in ActewAGL's final decision. At this point, we note that accepting either proposal would significantly increase the complexity of annual updating and may result in annual updating being impractical to implement. Accordingly, if we accepted either proposal in the future then we would need to reassess our position on whether the advantages of annual updating continue to exceed the disadvantages.

We consulted on an amended post-tax revenue model (PTRM) that provides enough flexibility to implement the return on debt approach in this decision (or other potential approaches). We published the amended PTRM in January 2015, and have applied that version of the PTRM in this preliminary decision.

Simple or weighted averaging

Our preliminary decision is to calculate the allowed return on debt as a simple (that is, equally weighted) average of the prevailing market rates in each of the past 10 years, following a transition period.[464] This is consistent with the approach we proposed in the Guideline. Energex and Ergon Energy proposed an alternative weighting approach, based on the ‘debt component of the forecast capex approved in the PTRM’.[465] This is a more complex approach, which effectively weights the prevailing rates in each of the past 10 years by the amount of debt that the service provider was forecasted in its PTRM to have raised in that year. We refer to this approach as the 'PTRM-weighted average' and we explain its mechanics in appendix G.

We do not accept this aspect of Energex and Ergon Energy's proposals. Energex and Ergon Energy's proposals presented some evidence in favour of the PTRM-weighted average. However, ultimately they did not satisfy us that the PTRM-weighted average will sufficiently advance the objective and requirements of the rules to warrant adoption of this more complex approach in place of our Guideline approach.

In summary, Energex and Ergon Energy submitted that the PTRM-weighted average will better meet the requirements of the rules mainly because it will:[466]

- better reflect the return on debt of the benchmark efficient entity, and
- promote better capex incentives.

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[464] Where the 'prevailing market rate' for a given year is the average of the prevailing interest rates during the service provider's specified averaging period for that year.

[465] Energex, *Regulatory proposal 2015–2020*, October 2014, pp. 167–171; Ergon Energy, *Regulatory proposal 2015– 2020*, October 2014, pp. 142–143.

[466] Energex, *Regulatory proposal 2015–2020*, October 2014, p. 171; Ergon Energy, *Regulatory proposal 2015– 2020*, October 2014, p. 143.

These are two key factors to which we must have regard under the rules when determining the allowed return on debt.[467] Energex and Ergon Energy's proposals presented some evidence to suggest how the PTRM-weighted average might better promote these two factors. However, we are not satisfied that the PTRM-weighted average will necessarily better promote these two factors in all circumstances. Further, our analysis of data provided by Ergon Energy suggests that adopting the PTRM-weighted average might not result in a materially different revenue allowance for either Energex or Ergon Energy. We estimate the difference is only around 0.4 per cent of each service provider's total proposed building block revenue for the upcoming regulatory period.[468] Energex and Ergon Energy did not provide any quantitative analysis of materiality. We have had regard also to a submission from a consumer representative that supports maintaining the Guideline approach.[469]

On balance, therefore, we choose to maintain the Guideline approach of calculating the allowed return on debt as the simple average of the prevailing market rates in each of the past 10 years, following a transition period. We acknowledge, however, the potential advantages of the PTRM-weighted average in some circumstances. We are therefore open to future consideration—especially under the next guideline development process—of any new evidence that clearly demonstrates that the PTRM-weighted average better meets the objective and requirements of the rules. Our assessment of the PTRM-weighted average for the purposes of this preliminary decision is set out in greater detail in appendix G.

Return on debt —Implementation

The following sections set out our considerations on the implementation issues associated with estimating the return on debt. These issues are:

- the benchmark term of debt
- the credit rating of the benchmark efficient entity
- the choice of data series (or combination of data series) to estimate the efficient debt financing costs of the 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
- the averaging period used to estimate the return on debt for each regulatory year, and
- the annual process to update the return on debt

467 NER, cl. 6.5.2(k)(1) and (3).
468 See appendix G.
469 See appendix G.

Term

Our preliminary decision is to adopt a 10 year term for the return on debt. A 10 year term is the same as the term we proposed in the Guideline.

In the regulatory proposals currently before us, service providers proposed a 10 year term for the return on debt.[470] Similarly, service providers proposed a 10 year term for the return on debt in their revised proposals.[471] We agree with that component of those proposals. A 10 year term is also consistent with the advice from NERA and CEG.[472] However, the Queensland Council of Social Service (QCOSS) submitted a five year term would be more appropriate.[473] Further, Major Energy Users (MEU) submitted a five year or seven year term would better reflect actual costs.[474] We are satisfied that a 10 year term is commensurate with the efficient financing costs of the benchmark efficient entity. This is because:

- A long debt tenor is consistent with the long lived assets of the benchmark efficient entity and reduces refinancing risk. We consider a benchmark term of 10 years reflects service providers' efficient borrowing practices, given the efficient commercial borrowing arrangements available to them both in Australia and abroad.
- A 10 year term is similar to (though somewhat higher than) the industry average term at issuance of a sample of firms that are comparable to the benchmark efficient entity.

We explain each of these considerations further below.

The benchmark efficient entity is a regulated energy network service provider. Regulated energy network assets are long lived, and have asset lives that are longer than the terms that are commonly available for debt. The fewer the number of times the debt which funds these assets is required to be refinanced, the lower is the risk of refinancing the debt upon maturity. We refer to this as refinancing risk. On the other hand, the cost of longer term debt is generally higher than shorter term debt as debt holders require compensation for the risks associated with holding debt over a longer time period. Accordingly, the benchmark efficient

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470 ActewAGL, *Revenue proposal*, July 2014, p. 278; Ausgrid, *Revenue proposal*, June 2014, p. 70; Directlink, *Revenue proposal*, June 2014, p. 37; Endeavour Energy, *Revenue proposal*, June 2014, p. 104; Energex, *2015–20 regulatory proposal*, October 2014, p. 166; Ergon Energy, *Appendix C: Rate of return regulatory proposal*, October 2014, p. 139; Essential Energy, *Revenue proposal*, June 2014, pp. 90–91; JGN, *Access arrangement information*, June 2014, p. 96; SAPN, *Regulatory proposal 2015–20*, October 2014, p. 338; TasNetworks, *Revenue proposal*, June 2014, p. 108; TransGrid, *Revenue proposal*, June 2014, p. 178.

471 ActewAGL, *Revised regulatory proposal*, January 2015, p. 430; JGN, *Response to the AER's draft decision and revised proposal: Appendix 7.10*, February 2014, p. 2; TransGrid, *Revised revenue proposal*, January 2015, p. 116. Directlink did not propose to depart form the Guideline for calculating the return on debt (which is based on a 10 year term) in Directlink, *Revised revenue proposal*, January 2015, p. 12. The NSW distributors did not depart from their initial proposals, where they used a 10 year tenor: Ausgrid, *Regulatory proposal*, May 2014, 68; Endeavour Energy, *Regulatory proposal*, May 2014, p. 104; Essential Energy, *Regulatory proposal*, May 2014, p. 91.

472 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.

473 QCOSS, *Understanding the long term interests of electricity customers: Submission to the AER's Queensland electricity distribution determination 2015-2020*, 30 January 2015, p. 79.

474 MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 55.

entity faces a trade-off between the higher cost of issuing long term debt and lower refinancing risk. Overall, these considerations suggest the average debt term of the benchmark efficient entity may be long term. However, they do not provide clear guidance on what exactly that term should be.

During the development of the Guideline, we requested information from a range of privately owned service providers on the amount, type, term and credit rating of their debt issuances.[475] 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 is 8.7 years. 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.

However, as we discussed above in relation to the transitional arrangements, we consider that under the on-the-day approach, the benchmark efficient entity would have issued interest rate swaps to match the base rate component of its actual return on debt with the allowed return on debt. We also note that Lally explained how this lowers the effective debt term below the term at issuance, and thereby lowers the cost of debt (as shorter term debt is typically cheaper than longer term debt).[476] In this decision, we adopt a trailing average portfolio approach with transitional arrangements. The transitional arrangements are applied to existing debt and results in a similar allowed return on debt to the on-the-day approach. Accordingly, for existing debt, the benchmark efficient entity could be expected to continue to use interest rate swaps and this would reduce the effective term on the base component of its debt, lowering the cost of that debt.

In summary, we are satisfied that a 10 year term is a reasonable view at to the benchmark debt term. We also consider that, if anything, this assumption is more likely to overstate than understate the debt term of the benchmark efficient entity. This is because the industry average term at issuance is currently less than 10 years, and the benchmark efficient entity may have an incentive to enter into interest rate swaps on its existing debt that would further lower the effective term of that debt.

As we stated in the explanatory statement to the Guideline, we will continue to monitor the average debt term at issuance of regulated network service providers against the benchmark term.[477] We may also consider this information when we are assessing proposals for transactions costs or any proposed adjustment to the foundation model estimate of the return on equity. In this preliminary decision, we consider this information in relation to whether it is necessary to extrapolate the third party data series we adopt from the 10 year benchmark debt term. Our consideration of this issue is set out in the extrapolation and interpolation issues section below.

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475 Information was received from APA Group, CitiPower, Dampier to Bunbury Pipeline, ElectraNet, Envestra, Jemena, Multinet and United Energy, Powercor, SA Power Networks and SP AusNet.

476 Lally, *Transitional arrangements for the cost of debt*, 24 November 2014, p. 30.

477 AER, *Explanatory statement to the rate of return guideline*, 17 December 2013, p. 137.

We are not convinced with QCOSS' or MEU's submissions for a term shorter than 10 years. For instance:[478]

- QCOSS submitted a five year term better reflects a realistic debt setting period in Australian capital markets and that distributors' borrowing practices are more likely to be calibrated to internal treasury borrowing (which are likely to be short term) than the life of the assets. We do not consider this is consistent with the empirical evidence indicating the businesses comparable to the benchmark efficient entity issue debt with an average term of 8.7 years. We also understand that these comparable businesses issue both foreign and domestic bonds — and foreign bonds can provide very long term debt finance.[479] This does not appear inconsistent with MEU's observation that networks borrow capital for a range of maturities to cover risk.[480] However, we are not convinced this observation supports lowering the benchmark term given we observe comparator business issue at an average term of 8.7 years.
- QCOSS submitted a five year term reflects the length of the regulatory control period, and is consistent with giving the distributor an ex ante efficient rate of return matched to the prospective period. We considered this reasoning during the Guideline development process. Positions on matching the benchmark term to the regulatory control period tend to be based on the need to achieve NPV neutrality over the regulatory control period. In the Guideline, we concluded that this objective was not appropriate under a trailing average approach to debt. Rather, we would expect service providers to recover their return on debt on average over the term of the trailing average rather than over the regulatory period.[481] Given this, we are also not convinced with QCOSS' submission that a five year term would be more consistent with the move to annual adjustment of the cost of debt.
- QCOSS submitted the QCA and the NZ Commerce Commission use a five year period and markets are more liquid for five year borrowing than 10 year borrowing. While these may be true, we do not find these reasons provide convincing support to adopt a five year benchmark term.

Credit rating

Our preliminary decision is to adopt a BBB+ credit rating to estimate the return on debt. A BBB+ credit rating is the same rating we proposed in the Guideline.[482]

Energex, Ergon Energy and SAPN proposed a BBB credit rating.[483] In the recent revised proposals, the distributors proposed a BBB credit rating.[484] Several other service providers

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478 QCOSS, *Understanding the long term interests of electricity customers: Submission to the AER's Queensland electricity distribution determination 2015-2020*, 30 January 2015, p. 79.

479 Lally, *Implementation issues for the cost of debt*, 20 November 2014, p. 25.

480 MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 55.

481 AER, *Explanatory statement to the rate of return guideline*, December 2013, p. 147.

482 AER, *Rate of return guideline*, 17 December 2013, p. 21.

483 Energex, *Regulatory proposal*, October 2014, p. 153; Ergon Energy, *Appendix C: Rate of return, Regulatory proposal*, October 2014, p. 123; SAPN, *Regulatory proposal 2015–20*, October 2014, p. 305.

supported this position in their submissions on our draft decisions published in November 2014.[485]

More broadly, in the resets that are currently open, different service providers, consultants and other stakeholders have proposed different credit ratings for the benchmark efficient entity. In particular:

- Service providers' positions were mixed. For instance, TransGrid, Directlink and TasNetworks each proposed a BBB+ credit rating.[486] In contrast, distributors proposed a BBB credit rating.[487] Several other service providers supported this position in their regulatory proposals and submissions on our draft decisions.[488] Some service providers submitted we should have regard to the individual circumstances of government owned service providers that risk having their indicative credit rating downgraded to be below our benchmark credit rating.[489]
- Consultants' positions were mixed. For instance, NERA and Houston Kemp (commissioned by TransGrid) recommended a BBB+ credit rating.[490] NERA stated 'in our opinion a BBB+ credit rating is the best estimate of the benchmark credit rating'.[491] In contrast, CEG (commissioned by Ausgrid, Endeavour Energy, Essential Energy and ActewAGL) recommended a BBB credit rating.[492] Further, Lally (commissioned by us)

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484 ActewAGL, *Revised regulatory proposal*, January 2015, pp. 431–432; Ausgrid, *Revised regulatory proposal and preliminary submission,* January 2015, pp. 70–71;Endeavour Energy, *Revised regulatory proposal*, January 2015, pp. 104–105;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.

485 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; United Energy, *Submission in relation to the first round of regulatory determinations under the new rules*, February 2015. To support these proposals, service providers submitted 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.

486 For revised proposals, see TransGrid, *Revenue proposal*, May 2014, p. 178; Directlink, *Revenue proposal*, May 2014, p. 36; TasNetworks, *Tasmanian transmission revenue proposal,* May 2014, p. 108. Also see TransGrid, *Revenue proposal*, May 2014, p. 178; Directlink, *Revenue proposal*, May 2014, p. 36; TasNetworks, *Tasmanian transmission revenue proposal,* May 2014, p. 108.

487 ActewAGL, *Revised regulatory proposal*, January 2015, pp. 431–432; Ausgrid, *Revised regulatory proposal and preliminary submission,* January 2015, pp. 70–71;Endeavour Energy, *Revised regulatory proposal*, January 2015, pp. 104–105;Essential Energy, *Revised regulatory proposal*, January 2015, p. 230.

488 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; Ergon Energy, *Appendix C: Rate of return, Regulatory proposal*, October 2014, p. 123; 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. To support these proposals, service providers submitted 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.

489 Ergon Energy, *Submission on the draft decisions: NSW and ACT distribution determinations 2015–16 to 2018–19*, 13 February 2015, p. 7.

490 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.

491 NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014, pp. ii, 10.

492 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.

recommended a credit rating for energy networks of BBB to BBB+, both at the present time and as an estimate of the benchmark credit rating over the next five years.[493] This is consistent with SACES analysis of the Kanangra report; which was written in mid-2013, before several credit rating upgrades occurred.[494] Similarly, the South Australian Centre for Economic Studies (SACES) also recommended a credit rating of BBB to BBB+. This was in its report for the South Australian Council for Social Services (SACOSS).[495]Consumer groups generally submitted using a benchmark credit rating of BBB+ or higher or submitted placing less reliance on credit ratings in general. For instance:

- Several consumer groups and an energy retailer advised against lowering the benchmark credit rating from BBB+ to BBB.[496] Some consumer groups also submitted the benchmark credit rating of BBB+ was too low.[497] For instance, Queensland Council of Social Service (QCOSS) favoured an A- benchmark credit rating.[498] Several consumer groups indicated we should recognise or have regard to service providers' actual credit ratings — particularly those that are government owned.[499]

- The CCP submitted that we do not need to base the allowed return on debt on the universe of bonds with a specified credit rating.[500] The CCP also noted that, 'TransGrid's actual borrowing costs are much lower than the costs implied by its credit rating'. [501] Further, the Energy Users Association of Australia (EUAA) supported using market information, benchmarking and investment returns to inform our rate of return allowance for network businesses.[502] While we see some merit in these submissions, at this stage, we consider it is a practical necessity to

493 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 28–31.

494 SACES, *Independent estimates of the WACC for SAPN: Report commissioned by the SACOSS*, January 2015, pp. 13–14.

495 This recommendation was informed by a Kanangra report; which was written in mid-2013, before several credit rating upgrades occurred. See SACES, *Independent estimates of the WACC for SAPN: Report commissioned by the SACOSS*, January 2015, pp. 13–14.

496 AGL, *SAPN regulatory proposal July 2015 to June 2010*, 30 January 2015, p. 14; APVI, *Submission to the AER on the issues paper on SAPN's regulatory proposal*, December 2014, p. 5; ECCSA, *AER SA electricity distribution revenue reset SAPN application: A response*, December 2014, pp. 74–75; SACOSS, *Submission to AER on SAPN 2015–2020 regulatory proposal*, January 2015, p. 21.

497 ECC, *Submission concerning the TransGrid revised revenue proposal 2014–19*, 3 February 2015; EMRF, NSW electricity transmission revenue reset: AER draft decision and TransGrid revised proposal, January 2015, p. 21.

498 QCOSS, Understanding the long term interests of electricity customers: Submission to the AER's Queensland electricity distribution determination 2015-2020, 30 January 2015, pp. 75–76.

499 Hugh Grant (CCP member), *CCP submission AER draft TransGrid determination, TransGrid revised revenue proposal*, 6 February 2015., pp. 12–13; ECC, *Submission concerning the NSW distribution networks revised revenue proposal 2014–19: Submission to the AER*, 11 February 2015, p. 2; EMRF, *NSW electricity transmission revenue reset: AER draft decision and TransGrid revised proposal*, January 2015, p. 23; MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 55; Tasmanian Small Business Council, *Submission to the AER: TasNetworks transmission revenue reset — Draft determination & revised proposal*, February 2015, p. 32.

500 CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2014, p. 6.

501 Hugh Grant (CCP member), *CCP submission AER draft TransGrid determination, TransGrid revised revenue proposa*l, 6 February 2015, p. 12.

502 EUAA, *Submission to TransGrid response to draft determination (2014 to 2019)*, 6 February 2015, p. 5.

predominately estimate the allowed return on debt on a benchmark credit rating and term.[503]

We adopt BBB+ as the benchmark credit rating because this is consistent with:

- The conceptual position that the benchmark efficient entity is likely to face low credit risk.
- The industry median credit rating of a sample of firms that are comparable to the benchmark efficient entity

We consider a BBB+ credit rating is consistent with the conceptual position that the benchmark efficient entity is likely to face low credit risk. McKenzie and Partington found credit risk for regulated utilities is likely to be relatively small because their default risk is low and the risk of credit migrations for utilities is low and stable.[504] The ratings agency, Moody's, appears to have previously concurred with this view, stating that the credit profile for Australia's regulated utilities sector continues to be underpinned by a regulatory framework that is mature and supportive in general.[505] Moody's more recently observed that Australian networks are under high quality regulatory regimes, which reduces their overall business risk.[506] We note that Standard and Poor's have previously considered the regulatory framework a critical aspect underlying regulated utilities' creditworthiness.[507]

Further, we consider a BBB+ credit rating is consistent with the industry median credit rating of a sample of firms that are comparable to the benchmark efficient entity.[508] The median credit rating is currently BBB+.[509] For historical periods of progressively longer length (starting with the current year, then the last two years and etcetera, up to the last 10 years), the median credit rating has been BBB+ in three out of ten cases, BBB+/BBB in six cases, and BBB in one case. While some evidence supports a BBB credit rating (for example, the median over 2009– 2015), we are satisfied that, on balance, the evidence supports a BBB+ credit rating (for example, the median over the periods 2013–2015, 2014–2015 and 2015). 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 is 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).

503 The practical necessity predominately arises from the requirement for annual updating and our subsequent use of a third party data series. See the section on the use of a third party data series in this attachment. Also, see appendix H on the return on debt, for an explanation on why we use credit ratings as an indicator of the return on debt.

504 McKenzie, *Partington, Risk, asset pricing models and WACC*, June 2013, p. 15.

505 Moody’s, *Industry outlook: Australian Regulated Utility Networks*, 21 February 2013, p. 8.

506 Moody's, Rating methodology: Regulated electric and gas networks, 25 November 2014, p. 34

507 Standard and Poor’s, *Key credit factors: Business and financial risks in the investor–owned utilities industry*, November 2008, p. 8.

508 We draw our comparator set for estimating the benchmark credit rating from Standard and Poor's industry report cards, with the exclusion of a firm that is government owned (Ergon Energy Corp Ltd.). We set our comparator set out in appendix H. These credit ratings were updated in August 2014.

509 Data are subject to updates and were last checked 7 April 2015.

Some service providers submitted that we should only have regard to short term observations to support the benchmark credit rating.[510] We have regard to both short term and longer term medians. This recognises there is a trade-off between using shorter term or longer term historical data. On the one hand, shorter term data is more likely to reflect current expectations. On the other hand, longer term data may reduce the influence on the median from firm specific or idiosyncratic factors that are unrelated to the benchmark efficient entity.[511] However, even if we only had regard to short term medians, we consider this would also support using a BBB+ benchmark credit rating.

Table 3-20 sets out the median credit rating over progressively longer averaging periods.

Table 3-20 Median credit rating-Comparator set of firms

Time period	Median credit rating	Time period	Median credit rating
2015 (to date)	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.

Also, we are satisfied that a benchmark efficient entity operating either an electricity transmission, electricity distribution, gas transmission or gas distribution network faces a similar degree of default risk. This is consistent with Lally's advice, who advised that he does not consider one can differentiate between the benchmark credit rating of electricity and gas service providers at the present time.[512] Accordingly, we are satisfied it is appropriate to adopt the same benchmark credit rating in our decisions for each of these sectors. Adopting a single credit rating is consistent with our adoption of a single benchmark efficient entity. Our reasons for this position are set out in the explanatory statement to the Guideline.[513] No new information has arisen since the publication of the Guideline that causes us to depart from t the benchmark efficient entity.

Response to key issues raised by stakeholders

Stakeholders submitted differing positions on the benchmark credit rating. We are not satisfied these submissions provide reason to depart from our BBB+ benchmark credit

[510] For example, Ergon Energy submits we focus on more recent data (the last five years). See Ergon Energy, *Submission on the draft decisions: NSW and ACT distribution determinations 2015–16 to 2018–19*, 13 February 2015, p. 7.

[511] Lally, *Implementation issues for the cost of debt,* November 2014, p .29.

[512] Lally, *Implementation issues of the cost of debt*, November 2014, p.31.

[513] AER, *Explanatory statement to the rate of return guideline*, 17 December 2013, pp. 32–45.

rating. In appendix H on the return on debt, we respond to the key issues that different service providers and consumer groups raised in relation to the benchmark credit rating.

We also recognise that the available third party data series currently available from the RBA and Bloomberg are both broad BBB rated data series. That is, both data series incorporate data from bonds which are rated BBB+, BBB and BBB-. Accordingly, adopting either a BBB+ or BBB benchmark credit rating is unlikely to have a practical impact on the estimation of the return on debt at this time.

Use of third party yield curves

Our preliminary 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.

The service provider proposals currently before us all propose using third party data series to estimate the return on debt. This includes Energex, Ergon Energy and SAPN.[514] This also includes the revised proposals before us.[515] We agree with this component of the proposals. In its submission to SAPN's regulatory proposal, the South Australian Centre for Economic Studies (SACES) also appeared to support this.[516] We agree with using third party data series to estimate the return on debt.

The CCP and several other consumer groups raised our use of third party data service providers as an issue in several of the current resets.[517] We have regard to these submissions in this preliminary decision. 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.[518] Similarly, in its submission to SAPN's regulatory proposal, the Energy Consumers Coalification of SA (ECCSA) submitted that both available third party yield curves have shortcomings. It also noted MEU's recommendation during the Guideline development process for the AER to develop its own series to replicate the return on debt for a pure play energy network. However, ECCSA accepted our use of third party data series for this review given we have not developed our own data series.[519]

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514 Energex, *Regulatory proposal*, October 2014, p, 172–173; Ergon Energy, *Regulatory proposal*, October 2014, pp. 144–146; SAPN, *Regulatory proposal*, October 2014, p. 339..

515 ActewAGL, *Revised regulatory proposal*, January 2015, p, 428; Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p, 178; Directlink, *Revised revenue proposal*, January 2015, p, 13; Endeavour Energy, *Revised regulatory proposal*, January 2015, p, 200; Essential Energy, *Revised regulatory proposal*, January 2015, p, 219; JGN, *2015–20 access arrangement: Response to the AER's draft decision and revised proposal, Appendix 7.10 — Return on debt response*, February 2015, p. 1; TasNetworks, *Revenue proposal*, May 2014, p. 108; TransGrid, *Revised revenue proposal*, January 2015, p. 116.

516 SACES, *Independent estimates of the WACC for SAPN: Report commissioned by the SACOSS*, January 2015, p. 14.

517 We are concurrently assessing eight revised regulatory proposals. We are also assessing three regulatory proposals for Queensland and South Australia.

518 CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2014, pp. 4, 12.

519 ECCSA, *SA electricity distribution revenue reset: A response*, December 2014, p. 80.

We are satisfied that using a third party data series (or multiple series), appropriately chosen, is commensurate with the efficient debt financing costs of the 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 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 allowed rate of return objective.
- 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 others use their own data series (with or without it being cross checked against a third party data series).[520] The Australian Competition Tribunal has found both approaches reasonable.[521]

We explain our first reason listed above in more detail here. The NER and NGR 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.[522] Even if this were not a rule requirement, using a third party data series may be the only practical option to update the return on debt annually. This position is supported by NERA, who advised that:

> …a third party data service provider is essential to allow the return on debt to be updated automatically'.[523]

[520] IPART has recently 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 an econometric approach (and uses the approaches of independent data service providers 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.

[521] 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.

[522] NER, cl.6A.6.3(l), NER, cl. 6.5.2(l) and NGR, r. 87(12).

[523] NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014, p. 10.

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 in 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 distribution determination. We can then add a formula to the determination and apply it mechanistically during the annual debt update process.

During the Guideline development process, we considered the use of a third party data series, in consultation with stakeholders.[524] Service providers tended to support using a third party data series.[525] While consumer representatives tended to consider we should develop our own data series.[526] We acknowledge these views and respond to them in appendix H. However, our preliminary decision is to use a third party data series, in the context of annual updating. This is for the reasons set out above.

Choice of data series

Our preliminary decision is to annually update the trailing average portfolio return on debt, over the service provider's averaging period, using a simple average of:

- the RBA broad-BBB rated 10 year curve (the RBA curve) and;[527]
- where available, the Bloomberg broad-BBB rated 7 year BVAL curve (the BVAL curve), otherwise the Bloomberg broad-BBB rated 5 year BVAL curve.[528]

We consider a simple average of the two curves will contribute towards a return on debt that is commensurate with the efficient debt financing costs of the benchmark efficient entity. This is because:

- Based on analysis of the bond selection criteria, we are not satisfied that either curve is clearly superior to the other.
- Based on analysis of the curve fitting (or averaging) methodologies, we are not satisfied that either curve is clearly superior to the other.

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524 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.

525 ENA supported using Bloomberg FVC and APA also 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.

526 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.

527 The RBA refers to this curve as 'Non-financial corporate BBB-rated bonds'.

528 The Bloomberg ticker for this curve is: BVCSAB07.

- Both curves require adjustments from their published form to make them suitable. We are not satisfied that either can be more simply or reliably used for estimation of the annual return on debt.
- A simple average is consistent with Lally's advice to adopt a simple average of the BVAL curve and the RBA curve, subject to the necessary adjustments to each curve.[529] After analysing both curves, Lally concluded it was reasonably likely that a simple average would produce an estimator with a lower mean squared error (MSE) than using either curve in isolation. Lally also noted, 'on the question of which index better reflects the cost of debt for the efficient benchmark entity, there is no clear winner'.[530]
- The two curves have regularly produced substantially different results at particular points in time. While we are not satisfied that either curve is clearly superior, this suggests that it may not be appropriate to simply select one curve or the other.
- A simple average of two curves, in these circumstances, is consistent with the Australian Completion Tribunal's decision in the ActewAGL matter where it concluded that:[531]

  > 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.

- 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.

Further, our preliminary decision is also to make certain adjustments to the RBA and BVAL curves. For the RBA curve, our preliminary decision is to interpolate the monthly data points to produce daily estimates, to extrapolate it to an effective term of 10 years, and to convert it to an effective annual rate. For the BVAL curve, our preliminary decision is to extrapolate it to 10 years using the spread between the extrapolated RBA 7 and 10 year curves, and to convert it to an effective annual rate. These issues are discussed in the section on extrapolation and interpolation. In this section, we discuss our reasons for adopting a simple average of the two curves. In addition, a detailed step by step description of our estimation approach is set out in Appendix I. This is the formula that will be automatically applied to give effect to the requirements of the rules.[532]

There is a range of views from service providers on the choice of data series. In the regulatory proposals currently before us:

- Ergon Energy proposed using the RBA curve but appeared open to using the BVAL curve, or a combination of the BVAL and RBA curves. However, this appeared to be

529 Lally, *Implementation issues for the cost of debt*, November 2014, p.3.

530 Lally, *Implementation issues for the cost of debt*, November 2014, p. 5.

531 In this decision, the issue before the Australian Competition Tribunal was the choice between the Bloomberg BFVC and the CBASpectrum curve, neither of which are currently published. See: *Application by ActewAGL Distribution [2010] ACompT4*, 17 September 2010, paragraph 78.

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

subject to us addressing its concerns regarding our extrapolation method. Ergon Energy submitted an alternative extrapolation method that QTC developed.[533]

- Energex proposed using the RBA curve but was open to us applying the BVAL curve if our review of the curves identified significant concerns with the RBA data. It voiced concerns with the extrapolation method we have used in the past.[534] Energex noted that, 'as an alternative, Energex sees merit in QTC's extrapolation methodology, which is sourced from its quarterly credit margin survey'.[535] Energex also later submitted that both the RBA and BVAL curves are reputable and independent.[536]
- SAPN proposed to give 50 per cent weighting to each of the Bloomberg BBB BVAL (extrapolated to 10 years) and RBA yield curves.[537] ActewAGL, Directlink, TasNetworks and TransGrid also supported this in their revised proposals.[538] However, TransGrid expressed a preference towards using the RBA curve and only supported using the BVAL curve when seven year data is available.[539]
- Ausgrid, Endeavour Energy and Essential Energy proposed placing 100 per cent weight on the RBA curve.[540]
- JGN proposed to place 100 per cent weight on either the RBA curve or the BVAL curve, depending on an annual assessment of which curve produces a better fit to certain tests proposed by JGN. This could lead to the RBA curve being adopted in some years, and the BVAL curve being adopted in other years. United Energy and Jemena supported this approach in their submissions.[541]
- Further, accepting we would not develop our own series to estimate the return on debt for a pure play energy network, ECCSA favoured averaging the RBA and BVAL yields curves.[542]

As noted above, our preliminary decision is to adopt a simple average of the RBA and BVAL curves. Our reasons for this position are set out below and in appendix H.

533 Ergon Energy, *Appendix C: Rate of return, Regulatory proposal*, October 2014, p. 144–146; QTC, *An alternative extrapolation method to estimate the 10-year BBB+ corporate yield*, October 2014.

534 Energex, *2015–20 regulatory proposal*, October 2014, pp. 172–173.

535 Energex, *2015–20 regulatory proposal*, October 2014, p. 173.

536 Energex, *Response to AER issues paper – Qld electricity distribution regulatory proposals*, January 2015.

537 SAPN, *Regulatory proposal 2015–20*, October 2014, p. 339,

538 TransGrid, *Revised revenue proposal*, January 2015, p. 9.

539 ActewAGL, *Revised revenue proposal 2015–19*, January 2015, p. 428; Directlink, *Revised revenue proposal,* January 2015, p. 12; TransGrid, *Revised revenue proposal*, January 2015, p. 9. TasNetworks supported this implicitly by accepting our rate of return draft decision. See TasNetworks, *Tasmanian revised transmission revenue proposal*, January 2015, p. 5.

540 Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p. 178; Endeavour Energy, *Revised regulatory proposal*, January 2015, p. 200; Essential Energy, *Revised regulatory proposal*, January 2015, p. 219.

541 Jemena, *Submission in relation to the first round of regulatory determinations under the new rules*, 6 February 2015, p. 8; United Energy, *Submission in relation to the first round of regulatory determinations under the new rules*, 6 February 2015, pp. 10–11.

542 ECCSA, *AER SA electricity distribution revenue reset SAPN application: A response*, December 2014, p. 80.

Comparative analysis of the two curves

In the Guideline, we proposed to use one or more third party data providers to estimate of the return on debt.[543] However, at that time we had not formed a view on which data series to use. In April 2014, we released an issues paper setting out our considerations in making this choice and sought submissions from service providers.[544]

For this preliminary decision, we have considered which curve or combination of curves will better reflect the efficient financing costs of the benchmark efficient entity. In particular, we have considered three main factors in reaching our decision. These are:

- Technical characteristics—we consider this is the most important aspect in selecting between the curves. This is because it focuses on underlying characteristics that will inform how the curves may behave over the course of the regulatory control period. We can evaluate the underlying characteristics of the curves to determine if one is consistently superior to the other against the criteria set out in the Guideline.[545] The characteristics of the curves can be grouped into the bond selection criteria and the curve fitting (or averaging) methodology.
- Suitability for implementation—we have evaluated whether either curve can be more simply or reliably implemented in its published form. For example, during the 2014–15 averaging periods, the BVAL curve was only published to a 7 year term to maturity, and requires extrapolation to 10 years.[546] By contrast, the RBA curve only provides month-end estimates. It therefore requires interpolation to construct daily estimates where averaging periods begin or end on dates other than month ends. The RBA curve may also require extrapolation so the effective term to maturity is equal to the benchmark term of debt.
- Past performance—there are ways in which we can attempt to evaluate the past performance of the two curves. This might include attempting to test the curves against a selection of observed bond data to test which curve most accurately reflects that bond data. There are also other ways we can take into account past performance.

Technical characteristics

We have analysed the two third party data series based on each curve's:

- Bond selection criteria—this describes what data is included and excluded in the data series.
- Curve fitting (or averaging) methodology—this describes how that data is used to produce a return on debt estimate for a particular term (for example, 10 years).

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[543] AER, *Explanatory statement–Rate of return guideline*, December 2013, pp. 23–24.

[544] AER, *Return on debt: Choice of third party data service provider issues paper*, April 2014.

[545] AER, *Explanatory statement—Rate of return guideline*, December 2013, pp. 23–24.

[546] Since September 2014, the BVAL curve has only been published to 5 years. However, we understand that Bloomberg is likely to revise the BVAL methodology in late 2014 or early 2015, and that this revision may include terms of 10 years or longer.

Our analysis has been informed by information from the RBA and expert reports by REU and Lally.[547]

Based on this analysis, we consider that the two curves are substantially different in both bond selection criteria and curve fitting methodologies. However, we are not satisfied that either curve is clearly superior to the other. Particularly with respect to the bond selection criteria, we are satisfied that there may be circumstances in which the RBA curve provides a better estimate of the return on debt of the benchmark efficient entity, and circumstances when the Bloomberg curve provides a better estimate.

In assessing the technical characteristics of the two curves, we have had regard to the assessment criteria set out in the Guideline. An evaluation of the two curves against these criteria is set out in Appendix H.

Bond selection criteria

In the first stage of deriving their curves, the RBA and Bloomberg compile a sample of bond pricing observations subject to certain bond selection criteria. Since these criteria govern the input data for estimation, they are critical to the overall estimate.

Table 3-21, below, sets out the bond selection criteria for which we observe differences between the BVAL curve and the RBA curve.[548] The table also includes a column with summary observations on which bond selection criteria, if either, is likely to better match the efficient financing practices of the benchmark efficient entity.

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[547] Arsov, Brooks and Kosev, 'New measures of Australian corporate credit spreads', *RBA bulletin December quarter 2013*, December 2013; REU, *Return on debt estimation: a review of the alternative third party data series*, August 2014; Lally, *Implementation issues for the cost of debt*, November 2014.

[548] The criteria listed match those criteria identified by Lally that relate to the bond selection criteria. See: Lally, *Implementation issues for the cost of debt*, November 2014, pp.35-37.

Table 3-21 Bond selection criteria—Comparison between RBA and BVAL curves

Criteria	RBA curve	BVAL curve	Comments
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	We are satisfied that the Bloomberg criterion is likely to be moderately superior. While the two curves have different proxies for liquidity, Lally advised that the BVAL score is likely to address the issue of data quality more directly and effectively than the RBA curve.[549]
Issuing entity	Non-financial corporations only Incorporated in Australia	Both financial and non-financial corporations Australia is identified as the country of risk	We are not satisfied that either curve is clearly superior. As the benchmark efficient entity is a non-financial corporation, the RBA criterion appears to be superior to the extent there is a systematic difference in the cost of debt between financial and non-financial corporations. However, Lally identified that there is no a priori reason to expect such a difference, and that the Australian empirical evidence is unclear.[550] Further, Lally observed that even if the bonds are biased, the potential reduction in standard deviation arising from the increase in sample size may outweigh the potential bias from including these bonds.[551]
Secured/ unsecured	Both secured and unsecured bonds	Unsecured senior bonds only	We are not satisfied that either curve is clearly superior. Lally recommended that in order to estimate a uniform cost of debt for a benchmark efficient entity, the underlying sample must include both the secured and unsecured bonds by issuers in the sample.[552] This is because the granting of security to some bonds is necessarily at the expense of others, and therefore lowers the cost of debt on some and raises it on others. Neither the BVAL curve nor the RBA curve meets this condition. However, the BVAL curve's exclusion of secured bonds is likely to

549 Lally, *Implementation issues for the cost of debt*, November 2014, p. 9.
550 Lally, *Implementation issues for the cost of debt*, November 2014, p. 36.
551 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 9-10.
552 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 10-11.

			impart some amount of upward bias. Nonetheless, Lally observed that this effect is unlikely to be significant given the current sample composition and is unlikely to be systematic.[553]
Credit rating	Broad BBB (BBB-, BBB, BBB+) S&P bond rating if available, otherwise S&P issuer rating	Only bonds with broad BBB credit rating are included. If available, Bloomberg composite rating is used, if not, either S&P, Moody's or Fitch ratings are used if available	We are not satisfied that either curve is clearly superior. Lally observed that both criteria include S&P bonds, and each expands the sample in different ways. However, the expansions currently have minimal impact on sample composition.
Currency of issue	AUD, USD, Euro	AUD	We consider this criterion could have a material impact on curve estimates. However, we are not satisfied that either curve will consistently be a better fit to the efficient financing practices of the benchmark efficient entity. Rather, we consider that either curve may be a better fit subject to market conditions. Lally concluded that there are 'pros and cons' to including data on foreign currency bonds.[554] For instance, domestic companies do issue bonds in overseas markets, suggesting the inclusion of foreign bonds may be advantageous. Further, domestic bonds that meet the RBA's bond selection criteria are currently 'heavily skewed' towards shorter terms to maturity. However, Lally identified that the data for Euro bonds currently available in this sample may be low quality.[555] Also, Lally observed that since the foreign bonds included in the RBA's

[553] Lally, *Implementation issues for the cost of debt*, November 2014, p. 36.

[554] Lally, *Implementation issues for the cost of debt*, November 2014, pp. 14-15.

[555] That is, the secondary market activity in such bonds is low, and most of the data is "indicative non-binding bid and offer quotes".

			sample are from a variety of markets, and in some cases different markets to the lender, the resulting estimate of the return on debt may be biased.[556] This may occur due to differing perceptions across different markets of the default risk of Australian firms. Using an index that includes foreign bonds implies the assumed foreign to domestic bond mix will be weighted in proportion to their inclusion in the index rather than their current usage by Australian regulated energy businesses. Lally observed that the RBA curve currently overweights foreign bonds by a greater extent than the BVAL curve underweights them.[557] At every point in time at which the trailing average is updated, the presence of bonds in an index sample reflects earlier financing decisions. For example, because bonds issued with ten years term to maturity could remain in the sample up to nine years later. Lally observed that this variability could exaggerate the problem of overweighting/underweighting.[558] There is evidence to suggest a varying difference between the debt risk premia of domestic and foreign bonds, for the same term and after the currency swap, at different points in time.
Embedded options	Both bullet bonds and bonds with embedded options.	Bullet bonds only.	We are satisfied that the Bloomberg criterion is likely to be moderately superior. As identified by Lally, the presence of embedded options (such as call, put or conversion options) affects the return on debt. This is because investors may assign some value to the possibility that the option may or may not be exercised. However, the value of these options 'is not and cannot' be reflected in the regulatory process.[559] Therefore, unless the yield estimates are adjusted to remove the effect of the options, this could introduce bias. However, the proportion of bonds with options in the current sample is low, and the issue is therefore currently unlikely to be material. However, this could plausibly change in the future, increasing the impact.

Source: Lally, AER analysis.

556 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 14-15.
557 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 14-15.
558 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 14-15.
559 Lally, *Implementation issues for the cost of debt*, November 2014, p. 14-15.

Overall, we are not satisfied that either curve's bond selection criteria will be consistently superior to the other's over time. For some of the above points of difference, Lally identifies that neither curve is likely to be consistently superior over time. That is, in some market circumstances, the RBA criterion may result in a sample that better reflects the circumstances of the benchmark efficient entity, but at other times the BVAL criterion may be superior. For other points of difference, Lally concludes that the likely differences in outcome caused by the two criteria are likely to be small. Overall we agree with Lally's conclusion that neither the BVAL curve nor the RBA curve is clearly superior.[560]

As we will annually update the return on debt estimate, it is important that we identify a curve or combination of curves that will give ongoing estimates that are appropriate in differing market circumstances throughout the regulatory period. For this reason, we are satisfied that the differences between the two curves' bond selection criteria support a combination of the curves, rather than selection of one or the other.

Curve fitting methodologies

After selecting a sample of bonds, the second main stage in curve construction is to fit the curve to the data points. Overall, we are not satisfied that either curve has a clearly superior curve fitting (or averaging) methodology. However, in contrast to the sample selection criteria, our assessment is limited by the information available. This is because there is relatively little information publicly available about Bloomberg's proprietary curve fitting methodology. We consider the greater transparency of the RBA curve fitting methodology is advantageous compared to the less transparent BVAL curve fitting methodology. However, based on the information that is available:

- As identified by Lally and the REU, the BVAL curve is a par yield curve, whereas the RBA curve is not.[561] A par yield curve gives the yield for which the price of the bond is equal to its face (par) value.[562] This is equivalent to the task of setting the return on debt within a building block revenue framework.[563] For this reason, par yield curves are more appropriate for this purpose.[564] This favours the BVAL curve over the RBA curve.[565] However, as identified by Lally, the magnitude of difference between estimates is likely to be small and non-systematic in direction.[566]
- The RBA averaging methodology is a weighted average of credit spreads on individual bonds. The REU identified that the BVAL curve fitting methodology appears to include 'some kind of local linear regression with an additional

560 Lally, *Implementation issues for the cost of debt*, November 2014, pp.17-18.
561 Lally, *Implementation issues for the cost of debt*, November 2014, pp.17–18; REU, *Return on debt estimation: a review of the alternative third party data series*, August 2014, p. 32.
562 Nasdaq, *Financial Glossary*, Available at: http://www.nasdaq.com/investing/glossary/p/par-yield.
563 Lally, *Implementation issues for the cost of debt*, November 2014. pp. 17-18
564 Lally, *Implementation issues for the cost of debt*, November 2014. pp. 17-18.
565 REU, *Return on debt estimation: a review of the alternative third party data series*, August 2014, p. 13.
566 Lally, *Implementation issues for the cost of debt*, November 2014. pp. 17-18.

smoothing step'.[567] REU concluded that, based on the limited information available, the approaches appear to be 'somewhat similar'.

In summary, the RBA's averaging methodology is more transparent than BVAL's curve fitting methodology, and this favours the RBA. However, a key methodological issue that is known about the BVAL methodology is that it is a par yield curve, while the RBA's methodology is not. This favours BVAL because the use of a par yield curve is more consistent with the building block framework. On the other hand, the difference between the results of the two curves because of this issue is likely to be small. On balance, we are not satisfied that either curve fitting (or averaging) methodology is clearly superior to the other.

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 line with our specified contingencies in this decision, we will adopt this curve where it is available. As Bloomberg has not backcast the updated curve methodology, we will apply the previous methodology as per the draft decision to estimate the annual cost of debt for 2014–15 and 2015–16. Further, we understand that Standard and Poor's may publish yield curves for corporate bonds issued in Australian dollars. Depending on the timing of this, we may review this data source and consider these yield curves in our revocation decisions.

Suitability for implementation

Neither the RBA curve nor the BVAL curve is suitable for implementation for our purposes in its published form. Both curves require some further adjustments to be fit for the purpose of estimating the return on debt for a 10 year benchmark term, and over averaging periods potentially ranging between 10 business days and 12 months. In particular:

- The BVAL curve was published for terms to maturity only up to 7 years through the service providers' averaging periods for 2014–15. Therefore, this curve must be extrapolated to 10 years to match the benchmark term over this time period. We discuss our approach to extrapolation in greater detail later in this attachment. From 15 September 2014 to 3 November 2014, Bloomberg temporarily ceased publishing this curve to 7 years. During this period, its maximum available term was 5 years. Where relevant, we have adopted the extrapolated 5 year estimate in line with the formula for automatic application and the specified contingencies in this preliminary decision. Further, 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 line with our specified contingencies in this decision, we will adopt this curve where it is

567 The BVAL curve is 'fitted to observations by using an adaptive mix of zeroth and first order non-parametric regression and subsequently smoothed by using rational Bezier polynomials . REU, *Return on debt estimation: a review of the alternative third party data series*, August 2014, pp. 13–14.

available. Where the 10 year curve is available, we only need to convert the published curve to an effective annual rate.

- The RBA curve is only published for one business day at the end of each month. However, in our experience, averaging periods commonly start or finish on other dates during a month. This is potentially problematic over an averaging period, since bond yields can vary substantially over a one month period. We cannot entirely eliminate this issue. However, where practical, we propose to interpolate between month-end dates to better match the service providers' averaging periods.
- Both curves require some form of extrapolation to match the benchmark term of debt. For the BVAL curve, this is to extend the estimate from the longest published yield to maturity out to the 10 year benchmark term. For the RBA curve, it is to extrapolate the spread component of the curve to an effective term matching the 10 year benchmark term.

Overall, we are not satisfied that either curve can be more simply or reliably implemented. However, we consider that both curves can be implemented:

- in a way that will be sufficiently robust, fit for purpose and replicable, and
- through the automatic application of a formula, as required by the rules.[568]

We discuss our approach to implementation in greater detail later in this attachment.

Past performance

Based on the available evidence to evaluate past performance, we conclude that there is insufficient reliable evidence to conclude that either curve is clearly superior. However, comparing the two curves over the period they have both been published suggests that the choice of one or the other could have a material impact on estimates of the return on debt. Where neither curve is clearly superior but the curves produce materially different estimates, we consider using a combination of curves may better reflect the efficient financing costs of the benchmark efficient entity.

To robustly evaluate whether either curve is superior based on past performance, we would need a definitive, objective 'source of truth' or reference point against which to test the data. The benchmark return on debt is an unknown parameter, and we are not aware of any such reference point. In addition, the limited availability of data for bonds matching our benchmark has, in the past, contributed to third party service providers ceasing to provide reference curves for long dated, low rated, debt.[569] For these reasons, we are not satisfied there is sufficient data available to perform a meaningful, objective test on which curve has performed 'better' in the past. As such, we have relied primarily on the underlying characteristics of the two curves in testing whether either is demonstrably superior.

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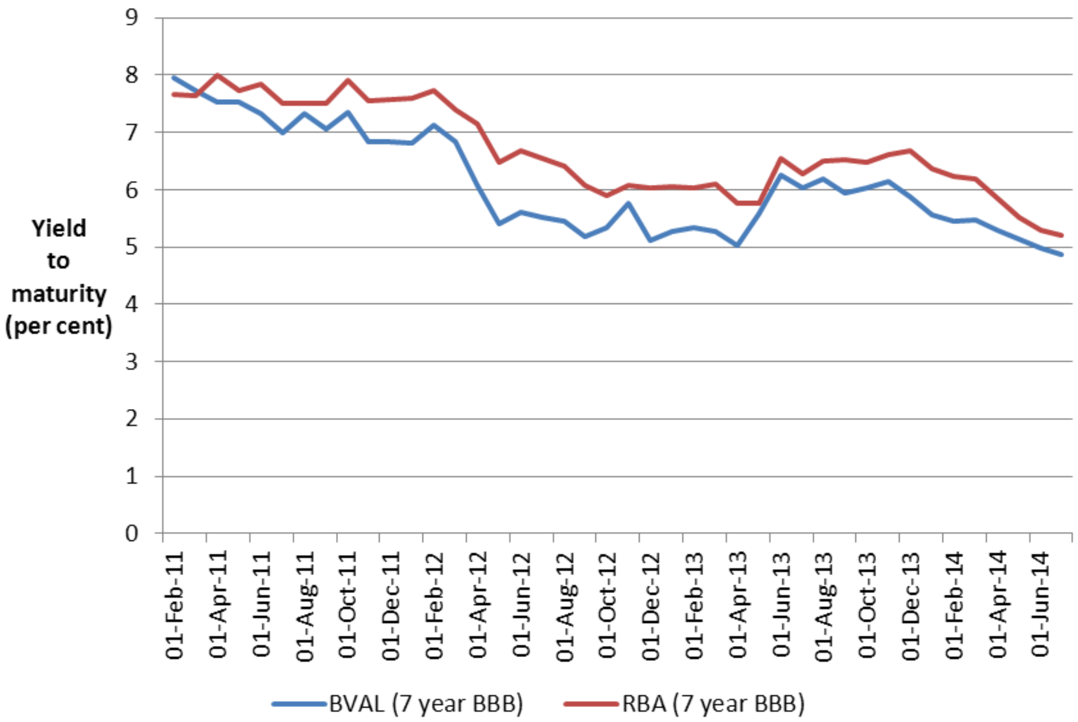
568 NER, cl. 6A.6.2(l), NER, cl. 6.5.2(l), and NGR, r. 87(12).

569 CBA, *Email to the AER–Re: CBASpectrum*, 19 August 2010.

Further, even if sufficient data was available, it is not clear that this analysis would add much additional information to the technical characteristics assessment described above. The RBA and BVAL curves are a function of their bond selection criteria and curve fitting (or averaging) methodologies. If the RBA or BVAL curves differ from the yields of a selection of bond data, it may be because the curves are based on different bond selection criteria to the basis on which the bond data was selected, or because the method of averaging that selection of bond data differs from the curve fitting (or averaging) methodology underlying the RBA or BVAL curves. Accordingly, this assessment of past performance would not so much be a test of 'accuracy' but is rather an indirect assessment of whether the bond selection criteria and curve fitting (or averaging) methodologies. That is, it is a test of whether the RBA's or BVAL's bond selection criteria is the same as the bond selection criteria used to select the sample of bond data chosen to do the 'accuracy' testing. Or it is a test of whether the RBA's averaging methodology or BVAL's curve fitting methodology is the same as the curve fitting (or averaging) methodology applied to the sample of bond data used to do the testing. Rather than focus on assessing these matters indirectly, we have relied primarily on assessing the bond selection criteria and curve fitting (or averaging) methodology directly in the technical characteristics assessment.

Nonetheless, by comparing the curves against each other, it is clear that they have produced substantially different results at different points in time. Figure 3-15, below, shows the seven year RBA and BVAL curves since 2010, which is the earliest year for which the BVAL series is available. In contrast, the RBA data series has been back-casted to 2005. We have used the seven year curves since 2010 in this illustrative example for comparability, and to remove the need for any extrapolation to the published data.

Figure 3-15 Comparison of RBA and BVAL 7 year curves



Source: AER analysis, Bloomberg, RBA.

Notes: The 7 year curves were chosen for comparison purposes as this is the maximum term that both published curves were available (without extrapolation) over the comparison period. Also, this is the RBA published 7 year yield estimate without any extrapolation. Extrapolation would generally increase further the differences between these curves.

The two curves have produced similar results at some times over the period for which they have both been continuously published. However, the curves have more regularly produced materially different results. Averaging periods can range from periods of ten business days up to 12 months.[570] As a result, there is scope for the choice of one curve or the other to have substantial implications for the return on debt depending on the selection of an averaging period. That is, if we were selecting a curve only for the averaging period for July 2013 when the estimates were very similar, we may conclude that the choice of curve is not material. However, the same consideration undertaken in 2014 would lead to a different conclusion. For example, between January and June 2014, there is an average difference of 55 basis points between the two curves.[571]

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570 AER, *Explanatory statement—Rate of return guideline*, December 2013, p 130.

571 That is, using the published BVAL yields on the same dates as the RBA curve is published for comparability, the difference in YTM is 55 basis points.

Minimising mean squared error

We are satisfied that a simple average of the BVAL curve and the RBA curve is reasonably likely to produce an estimator with a lower mean squared error (MSE) between the allowed return on debt and the 'true' return on debt, compared to using only the RBA curve or only the BVAL curve. In turn, we are satisfied that an estimator that meets the criteria set out in the Guideline and produces the lowest MSE of available alternatives will contribute to achievement of the allowed rate of return objective and reduce the potential mismatch between the actual and allowed return on debt of the benchmark efficient entity. For the reasons set out in this attachment, we are not satisfied that either curve is clearly superior. Therefore, to estimate the annual return on debt we will use a combination of the two curves, adjusted as described later in this attachment. We have chosen a simple average over alternative weightings in line with Lally's recommendation. This is because it is the weighting that minimises mean squared error where we have insufficient evidence to conclude that:

- the variance of the estimators differs, or
- any bias in the estimators is non-zero.

Having concluded that neither curve has demonstrably superior characteristics overall, Lally considers 'the usual criterion in selecting an estimator or combination is minimising the mean squared error (MSE) of the estimate'.[572] Lally notes that 'the MSE is the average over the squared differences between the estimated value and the true value'.[573] The optimal estimator is that which results in the lowest MSE. This approach appears to have parallels in the rules, which require that:[574]

> In estimating the return on debt under paragraph (h), regard must be had to the following factors:
>
> (1) 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 rate of return objective.

Lally concluded that, for the choice between the RBA curve or the BVAL curve or a combination, a simple average of the two curves will produce a lower MSE.[575] This is based on his observations that: [576]

- neither curve is demonstrably superior in its underlying characteristics
- the standard deviations for the BVAL and RBA curves are sufficiently similar that the standard deviations of the two estimators should be treated as equal
- there is no way to precisely measure the bias in either curve, and no reason to expect they have different or non-zero levels of bias

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572 Lally, *Implementation issues for the cost of debt*, November 2014, p. 19.
573 Lally, *Implementation issues for the cost of debt*, November 2014, p. 19.
574 NER cl. 6A.6.2(k)(1), NER, cl. 6.5.2(k)(1) and NGR, r.87(11).
575 Lally, *Implementation issues for the cost of debt*, November 2014, p. 22.
576 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 19-22.

- Therefore, subject to the above conclusions, a weighting of 0.5 for each curve is reasonably likely to result in the lowest mean squared error.

These observations appear to be consistent with the underlying characteristics of the individual curves and the uncertainty over the 'true' return on debt. Accordingly, we accept Lally's recommendation in reaching our conclusion.

Response to key issues raised by stakeholders

The position of service providers with current regulatory proposals appears mixed. In the regulatory proposals currently before us:

- Energex and Ergon Energy each expressed a preference towards using the RBA curve. They appeared willing to accept the BVAL curve if we were to adopt an alternative extrapolation method, developed by QTC.[577]
- SAPN proposed to give 50 per cent weighting to each of the Bloomberg BBB BVAL (extrapolated to 10 years) and RBA published series.[578]

We note the regulatory proposals submitted throughout May to June 2014 generally expressed a stronger preference towards using the RBA curve. For instance ActewAGL, Ausgrid, Directlink, Endeavour Energy, Essential Energy, TasNetworks and TransGrid proposed to place 100 per cent weight on the RBA curve.[579] Most of these service providers based their proposals on reports from CEG or NERA. As an exception, JGN proposed to place 100 per cent weight on either the RBA curve or the BVAL curve, depending on an annual assessment proposed by JGN.[580]

Since these service providers took a different position to Energex, Ergon Energy and SAPN, we do not respond to these in detail here. For a detailed response, see our draft decisions for these service providers.[581]

After considering the merits and limitations of both curves, our preliminary decision is to adopt a simple average of the RBA and BVAL curves. We have not been persuaded by the reasoning and analysis supporting the proposals of Ergon Energy and Energex in preference of only using the RBA curve. These included:[582]

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577 Energex, *2015–20 regulatory proposal*, October 2014, pp. 172–173; Ergon Energy, *Appendix C: Rate of return, Regulatory proposal*, October 2014, p. 144–146; QTC, *An alternative extrapolation method to estimate the 10-year BBB+ corporate yield*, October 2014.

578 SAPN, *Regulatory proposal 2015–20*, October 2014, p. 339,

579 See: ActewAGL, *Regulatory proposal*, July 2014, p. 276, Ausgrid, *Regulatory proposal*, June 2014, p. 70, Endeavour Energy, *Regulatory proposal*, June 2014, p. 104, Essential Energy, *Regulatory proposal*, June 2014, p. 90, TasNetworks, *Regulatory proposal*, June 2014, p. 108, TransGrid, *Regulatory proposal*, June 2014, p. 178.

580 JGN, *2015–20 access arrangement information Appendix 9.10: Return on debt proposal*, June 2014, pp. 18–30.

581 For example, AER, *Draft decision Ausgrid distribution determination 20154–16 to 2018–19, Attachment 3: Rate of return*, November 2014, pp. 147–150.

582 Energex, *2015–20 regulatory proposal*, October 2014, p. 172; Ergon Energy, *Appendix C: Rate of return, Regulatory proposal*, October 2014, p. 144.

- The RBA is a reputable and independent data provider. While we concur, we do not see it as a point of difference between the BVAL and RBA curves as Bloomberg is also a reputable and independent data provider.
- The RBA currently publishes BBB estimates for the longest term to maturity (which has recently been between eight and nine years). We do not consider this a relevant consideration because we still extrapolate both curves out to 10 years.
- Ergon Energy submitted the RBA's data is readily accessible by all stakeholders. We assume Ergon Energy is referring to the Bloomberg being a commercial service. We would expect any stakeholder interested in this level of detailed financial data (for instance, investors) would have access to Bloomberg's professional services. Therefore, we see this as a minor point.
- Ergon Energy submitted the RBA's methodology is transparent, although its underlying sample of bonds is not known. We note that other service providers also submitted this point.[583] We accept that the RBA is more transparent in relation its curve fitting (or averaging) methodology, but much of this difference appears overstated. For instance, both data service providers are transparent about their bond selection criteria. Arguably, Bloomberg is more transparent on its bond selection criteria because it discloses which bonds are included in its curve each day. Further, in relation to the curve fitting (or averaging) methodology, the transparency of the RBA curve favours that methodology. However, the BVAL curve is a par yield curve, whereas the RBA curve is not, and this favours the BVAL curve. Overall, we are not satisfied that in relation to the curve fitting (or averaging) methodology—where there is a difference in transparency between the curves—that one curve is clearly superior to the other.

Choice of data series—Extrapolation and interpolation issues

Our preliminary decision on extrapolation and interpolation issues is to maintain the approach set out in our recent draft 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 3-22 and Table 3-23. The impact of these adjustments is set out in Figure 3-16 and Figure 3-17.

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[583] ActewAGL, *Regulatory proposal: 2015–19 subsequent regulatory control period*, 2 June 2014 (resubmitted 10 July 2014), pp. 283–287; CEG, *WACC estimates, a report for NSW DNSPs*, May 2014, p. 43; NERA, *Return on capital for a regulated electricity network: A report for Ashurst*, May 2014, pp. iii, 18; Directlink, *Revenue proposal: Attachment 6.1 transitional approach to estimating the cost of debt*, May 2014.

Table 3-22 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.[584] 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 preliminary 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).[585] 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,[586] the base component of the published 10 year yield already matches the benchmark term of debt. Therefore, extrapolating this component would result would be erroneous and lead to overcompensation in most circumstances, where the yield curve is upward sloping. 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.[587] 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,

[584] For example, the difference between approaches over the 2-June 2014 to 30-June 2014 indicative averaging period is 0.22 basis points, or 0.0022 per cent.

[585] Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

[586] 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.

[587] AER, *Rate of return guideline—Explanatory statement*, December 2013, p. 136.

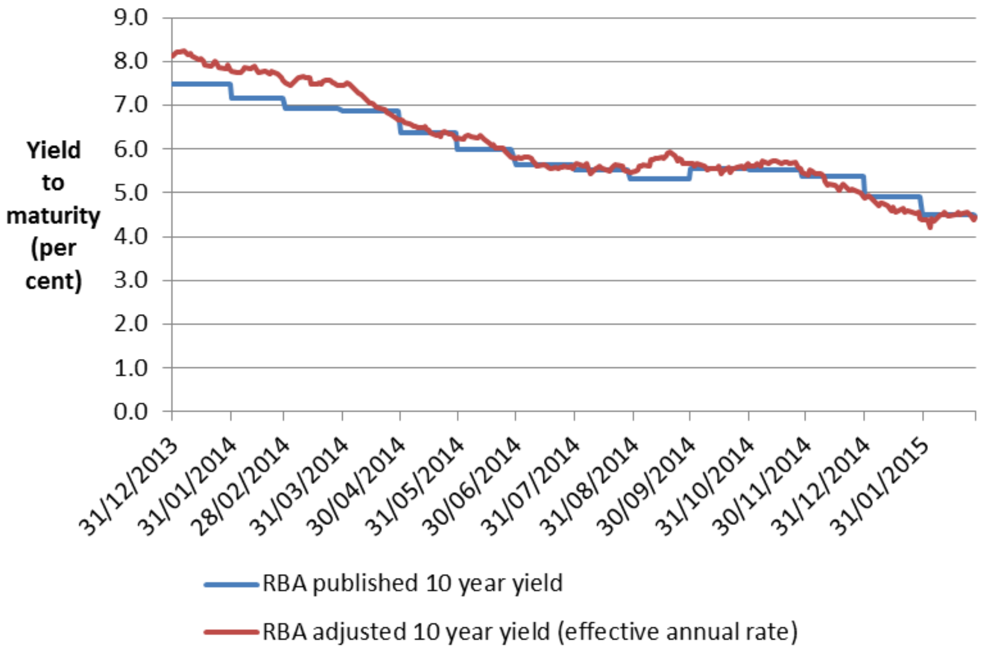
Adjustment Type	Amendment made?	Comments
		from its earliest available publication to February 2015, the average effective term of the RBA's bond sample for its 10 year estimate is also 8.7 years.[588] We recognise that the effective term of the RBA's sample may change each month. In some months, the 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 preliminary decision, we have maintained our draft decision position. 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'.[589] 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

[588] RBA, *Aggregate measures of Australia corporate bond spreads and yields*, available at: http://www.rba.gov.au/statistics/tables/xls/f03hist.xls.

[589] RBA, *Email in response to: AER follow up question on the basis of YTM quotations in RBA statistical table F3*, 16 October 2014.

Figure 3-16 Impact of adjustments to the published 10 year RBA yields



Source: AER analysis, RBA

Table 3-23 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.[590] In April 2015, Bloomberg revised its methodology for the BVAL curve (BVCSAB10) and it now publishes a 10 year estimate.[591] 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

590 Specifically, from 15 September 2014 to 3 November 2014.

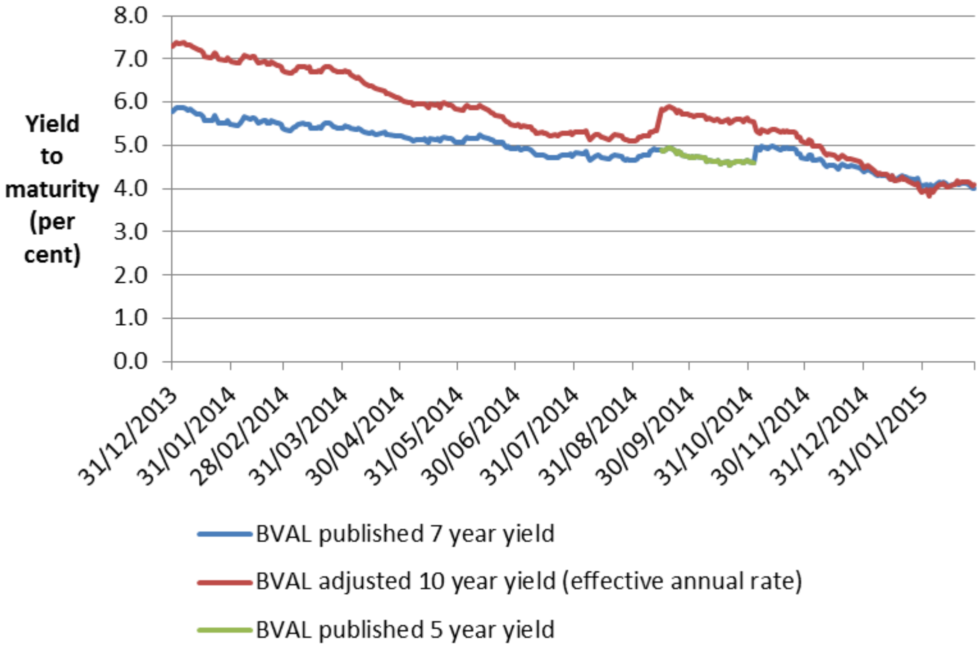
591 Specifically, 14 April 2015.

Adjustment Type	Amendment made?	Comments
		spread to CGS from 7 to 10 years As recommended by Lally,[592] we are satisfied this approach is comparably reliable to the more complex approaches submitted by other stakeholders,[593] 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. 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. Therefore, in line with our specified contingencies in this decision, we will adopt this curve where it is available. As Bloomberg has not backcast the updated curve methodology, we will apply the previous methodology as per the draft decision to estimate the annual cost of debt for 2014–15 and 2015–16.
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.

592 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38–44.

593 Incenta, *Methodology for extrapolating the debt risk premium*, June 2014, pp. 2–3; Energex, *Regulatory proposal*, November 2014, p. 174; Ergon Energy, *Regulatory proposal*, November 2014, p. 145; SA Power Networks, *Regulatory proposal*, November 2014, p. 340.

Figure 3-17 Impact of adjustments to the published 7 and 5 year BVAL yields



Source: AER Analysis, Bloomberg.

In contrast, Ergon Energy and SA Power Networks proposed alternative methodologies to extrapolate the RBA and BVAL curve. Specifically:

- SAPN proposed to adopt a regression based approach to extrapolating the DRP for both the RBA and BVAL yield curves that incorporates each point on the yield curve above 1 year (inclusive)[594]
- Energex and Ergon proposed to extrapolate the RBA curve using an approach proposed by QTC.[595] This method similarly applies a regression based approach using the 3, 5, 7 and 10 year published yields. QTC submits that this curve is preferable as it is less volatile and results in a lower estimate on average.[596]
- While these approaches are slightly different in practice, we have not adopted them because:
- the service providers have not demonstrated a basis for giving higher weight to points on a yield curve that are further away from the term being estimated
- we are not persuaded that it is reasonable to assume a linear relationship between all published curve points when extrapolating. This is inconsistent with the

594 SA Power Networks, *Regulatory proposal*, November 2014, p. 340.

595 Energex, *Regulatory proposal*, November 2014, p. 174; Ergon Energy, *Regulatory proposal*, November 2014, p. 145.

596

published data by either the RBA or BVAL, which rarely demonstrates such a linear relationship

- regarding QTC's submission about the volatility of its estimate, we are not persuaded that a moderately less volatile estimate is necessarily more reliable.

Choice of data series — Contingencies

We have made our preliminary decision based on the information and third party data that is currently available. Nonetheless, in our experience it is common that the availability of third party data changes. Our preliminary 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.[597] This means that our decision on how to apply these third party data sources must be fully specified, and must be capable of application over the five year regulatory control period without the use of subsequent judgement or discretion. For this reason, we have set out a series of contingencies in Table 3-24, below. These describe how we propose to estimate the annual return on debt in the event of changes to data availability.

Table 3-24 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.	We will not apply estimates from a third party data provider that we have not evaluated and included in our preliminary 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.
Bloomberg reduces the maximum published BVAL term from 7 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. We have adopted this approach for the period from 15 September 2014 to 3 November 2014 where the 7 year BVAL curve was unavailable. 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,598 from the RBA's longest published effective term to 10 years

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

[598] Specifically, the spread to CGS.

Event	Changes to approach
	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.
Bloomberg increases the maximum published BVAL term from 7 years.	If the longest published term is between 7–10 years, we will extrapolate it to a 10 year term using the corresponding margin from the RBA curve. If the longest term is 10 or more years, we will apply the 10 year BVAL curve un-extrapolated, but still adjusted to be an effective annual rate.
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.[599] 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.

[599] AER, *Explanatory statement*–*Rate of return guideline*, December 2013, pp. 23–24.

Averaging periods

Our preliminary decision is to accept Energex's proposed debt averaging periods for 2015–16 to 2019–20. We specify the averaging periods for the other regulatory years in confidential appendix K. This is because our practice is to keep the dates of averaging periods confidential until they have expired.

In assessing Energex's averaging periods, we have applied the approach in the Guideline. 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.[600] 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 rate of return objective.[601] Table 3-25 sets out why we consider an averaging period that meets these conditions contributes to the achievement of the rate of return objective.

Table 3-25 Assessment of proposed averaging periods against Guideline

Condition	Reasons for condition	Condition met?
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
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.	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.[602]	Yes
It should be as close as practical to the commencement of each	An averaging period at the start of the regulatory year would better reflect the return on debt for that period. However, to be capable of being practically applied,	Yes

[600] AER, *Rate of return guideline*, December 2013, p. 21.
[601] NER cl. 6.5.2(c).
[602] Lally, *Expert Report of Martin Thomas Lally*, 13 February 2011, pp. 9–10.

Condition	Reasons for condition	Condition met?
regulatory year in a regulatory control period.	the period must typically end somewhat before this date to allow us to complete our regulatory tasks such as modelling and pricing compliance. It also allows sufficient time to complete our quality assurance checks.	
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.	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
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.	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 periods. Accordingly, in practice we keep averaging periods confidential until they expire.	Yes

Source: AER, *Rate of return guideline*, December 2013, pp. 21-22; AER analysis.

Table 3-25 summarises our assessment of Energex's averaging periods against the conditions in the Guideline. Our detailed assessment is set out in confidential appendix K on the rate of return averaging periods.

In its submission, QCOSS recommended using the 20 businesses days as close as possible to the start of each financial year for estimating the allowed return on debt. QCOSS did not agree with distributors selecting a longer observation period because they may game the outcome by giving weight to historical debt that no longer applies.[603] We maintain the Guideline approach to allow return on debt averaging

[603] QCOSS, *Understanding the long term interests of electricity customers: Submission to the AER's Queensland electricity distribution determination 2015-2020*, 30 January 2015, pp. 79–80.

periods of 10 or more consecutive business days up to a maximum of 12 months.[604] We do not consider this flexibility provides any additional scope for weighting historical debt or for regulatory gaming. Consistent with the Guideline, at the time averaging periods are nominated, all dates must take place in the future.

Annual debt update process

One of the conditions we proposed in the Guideline is that the averaging period should be, 'as close as practical to the commencement of each regulatory year'.[605] We considered how the process to annually update the return on debt would align with the publication of distribution prices. The timing of publishing distribution prices affects how late an averaging period can end and still be implemented in practice.

Table 3-26 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 (including Energex) 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 3-26 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

[604] AER, *Rate of return guideline*, December 2013, pp. 21–22.
[605] AER, *Rate of return guideline*, December 2013, p. 21.

Step	Timing	Description of step	Reasons for timing
			longer period (or requesting a shorter period) to accommodate their internal processes. [606]

Source: AER analysis.

The process outlined in Table 3-26 does not apply to the transitional 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 3-26, we propose calculating the return on debt, annual building block revenue requirement, and X factor in accordance with the formula in the distribution determination. 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. 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. In November 2014, the AEMC made a rule determination that affected this date.[607] The AEMC determined that:

- From 2017 — distributors will be required to submit their annual pricing proposal to us by 31 March each year.[608]
- Before 2017 — transitional arrangements will maintain the current date by which distributors must submit their annual pricing proposals.[609] This is by 1 May each year.[610]

606 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.

607 AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014.

608 Victorian DNSPs 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. See AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014, pp. 57.

609 AEMC, *Distribution network pricing arrangements, rule determination*, 27 November 2014, p. 103.

610 NER 6.18.2(a)(2) requires DNSPs 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 non-Victorian DNSPs, each regulatory year commences at the start of the financial year.

3.4.3 Gearing

Our preliminary 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.

In the initial proposals currently before us, service providers proposed a 60 per cent gearing ratio. We agree with that component of those proposals. The consumer challenge panel submitted that while the benchmark gearing is 60 per cent, 'in practice gearing is typically above 70 per cent'.[611]

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 Table 3-27 as are the Bloomberg market valuations using the 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.

611 Consumer challenge panel, *CCP1 submission to the AER re: the NSW DNSPs: Jam tomorrow?,* August 2014, p. 5.

Table 3-27 Average gearing ratio—Comparator set of firms

Year	2009 WACC review 2002–2007a	Bloomberg (market value) 2002–2012b (full sample)	Bloomberg (market value) 2002–2012 (refined sample)c	Standard and Poor's (book value) 2008–2012d
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[612]

3.4.4 Expected inflation rate

We are satisfied with Energex's proposed method for forecasting inflation.[613] Energex proposed to adopt the methodology for determining forecast inflation that has

612 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.

previously been adopted by us. This method is based on an average of the Reserve Bank of Australia's (RBA) short term inflation forecasts and the midpoint of the RBA's inflation targeting band. For this decision, we updated Energex's proposed inflation estimate to reflect the latest RBA forecasts, which result in an inflation forecast of 2.55 per cent per annum.

Table 3-28 AER inflation forecast (per cent)

Forecast inflation	2015–16	2016–17	2017–18 to 2024–25	Geometric average
Energex's proposal	3.0 [a]	2.5	2.5	2.55
AER update	2.75 [b]	2.75 [b]	2.5	2.55

Source: RBA, *Statement on Monetary Policy*, August 2014, p. 71; RBA, *Statement on Monetary Policy*, February 2015, p. 71.

(a) In its Regulatory Proposal, Energex calculated forecast inflation using inflation forecasts for the year ended June 2015, the year ended June 2016, and the mid-point of the RBA's inflation band for the remaining eight years. The figures used were taken from the RBA's August 2014 forecast. As Energex's regulatory control period begins July 2015, the 10-year forecast inflation rate starts with the inflation forecast for the year ended June 2016, and not June 2015 as noted by Energex. In this table we have corrected this.

(b) In February 2015, the RBA published a range of 2.25–3.25 percent and a range of 2.25–3.25 per cent for its June 2016 and June 2017 CPI inflation forecasts respectively. Where the RBA published ranges, we select the mid-points.

We expect the RBA to publish a more recent inflation forecast before our substitute decision, and we will update the value of the expected inflation rate accordingly in the substitute decision.

613 Energex, *Regulatory Proposal*, October 2014, p. 176.

A Equity models

During the rate of return guideline (the Guideline) process, we focused on four key models that might 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 (SLCAPM)
2. The Black Capital Asset Pricing model (Black CAPM)
3. The Fama French Three Factor Model (FFM)
4. The Dividend Growth Model (DGM)

We considered all models that have been proposed. In this sense, all of the models are relevant. Combined with this appendix, we also consider the proposed models under step two of section 3.4.1 in attachment three. While we have considered all proposed models, we are not satisfied that they are all of equal value. In addition to these models, we have considered information submitted in relation to non-standard versions of the SLCAPM — the Wright specification and long term (historical) specification. Section A.3 discusses the role we assign to each of these models, and our reasons for assigning these roles.

In this appendix, will consider material submitted in the current regulatory proposals before us.[614] We also consider material submitted in the revised proposals before us.[615] We also consider material submitted by consultants and a variety of other stakeholders.

In several revised proposals and submissions to our draft decisions published in November 2014, several service providers expressed preferences towards using models differently to how we have in the foundation model approach. Some service providers submitted:

- If the SLCAPM, Black CAPM, FFM and DGM are relevant material, then we should estimate the required return on equity using each of these models to give them real weight.
- The foundation model approach is, in effect, a mechanistic application of the SLCAPM (similar to that under the old rules) because we have regard to other evidence in a way that has no material impact on our estimate.

We are satisfied that we do not need to derive four distinct estimates of the return on equity using the SLCAPM, Black CAPM, FFM and DGM to have regard to these models. Further, we consider service providers have mischaracterised our foundation model approach. We elaborate on these considerations below.

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614 That is, proposals from Ergon Energy, Energex and SAPN.

615 That is, revised proposals from ActewAGL, Ausgrid, Endeavour Energy, Essential Energy, Directlink, JGN, TasNetworks and TransGrid.

A.1 Estimating models

Several service providers expressed preferences towards estimating the return on equity using four models — SLCAPM, Black CAPM, FFM and DGM. These service providers considered these four models to be relevant information that should be given substantial weight.[616]

We do not agree. These submissions appear to be motivated by an interpretation of NER clause 6.5.2(e)(1), which states:

> In determining the *allowed rate of return*, regard must be had to:
>
> (1) Relevant estimation methods, financial models, market data and other evidence

We consider that, through our foundation model approach, we have regard to relevant estimation methods, financial models, market data and other evidence in a way that contributes to the achievement of the allowed rate of return objective. Given that under the NER, we must estimate a return on equity that contributes to the achievement of the allowed rate of return objective, we are satisfied with this approach.[617]

We do not use each of these models to provide four distinct estimates of the return on equity for the benchmark efficient entity. We are not satisfied that combining four return on equity estimates using these four models (the multi-model approach) would contribute to the achievement of the allowed rate of return objective.

We provide our reasons for these positions in the sections.

A.1.1 The multi-model approach

Several service providers expressed preferences towards estimating the return on equity by combining four estimates from the SLCAPM, Black CAPM, FFM and DGM (the multi-model approach). As we explain below, we consider the multi-model approaches before us do not adequately consider the relative merits of each model. We also consider the high degree of complexity does not provide benefits, but rather reduces the transparency of these approaches. The evidence before us has not satisfied us that an approach with these features would contribute to the achievement of the allowed rate of return objective.

In the Guideline development process, we consulted on the approaches we could use to estimate the return on equity. We explored the options of adopting a primary model, a primary model with reasonableness checks, several primary models with fixed

616 AusNet Services, CitiPower/Powercor, JGN, SAPN, United Energy submitted this in, *Submission in relation to the first round of regulatory determinations under the new rules*, 6 February 2015. Also see ActewAGL, *Revised regulatory proposal 2015–19*, January 2015, p. 433; SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015, p. 5.

617 NER 6.5.2(f).

weights or a multi-model approach.[618] We found there was broad support from stakeholders for the second and fourth options—which are consistent with the foundation model approach and multi-model approach respectively. Consumer groups broadly favoured the foundation model approach.[619] Service providers broadly preferred a multi-model approach.[620]

In the Guideline, we adopted a foundation model approach over a multi-model approach.[621] This was for the following reasons:

- The reliance placed on material in multi-model approaches is not supported by the merits of that material. For example, we consider these approaches rely on the empirical estimates under the FFM and Black CAPM. However, there is substantial evidence illustrating the limitations with deriving estimates of expected returns using these models (see sections A.3.2 and A.3.3). Also, the multi-model approaches proposed to us give more weight to DGMs than what we consider would be warranted given their limitations (see section A.3.4).
- The increased complexity of multi-model approaches is not justified. This requires the full parameterisation of the SLCAPM, FFM, Black CAPM and a DGM. Some of these models (particularly the FFM and SFG's version of the DGM) are complex (see section A.3.2 and appendix B—DGM). In contrast, the SLCAPM and simpler DGM specifications are more intuitive, and are more amenable to robust and coherent analysis.[622] The multi-model approach is further complicated by quantifying and assigning weights to each return on equity estimate to derive a single point estimate. We do not consider this level of complexity fit for purpose for a variety of reasons.[623] In particular, this could make it difficult for stakeholders to engage with the regulatory process. For example:
    - This limits the ability to understand the variables driving the models' outputs and to assess the reasonableness of these outputs.
    - This could limit stakeholders' ability to estimate the returns they expect to be determined (in advance of a determination). For example, it may be difficult for stakeholders to form a view on the impact of prevailing market conditions on the factors required to implement the FFM.[624]

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618 AER, *Explanatory statement to the draft rate of return guideline*, pp. 99–100.

619 COSBOA, *Comments – draft guideline*, October 2013; Ethnic Communities' Council of NSW, *Submission to Better Regulation: Draft rate of return guidelines*, 10 October 2013; EUAA, S*ubmission to the draft guideline*, October 2013, p. 2; MEU, *Comments on the draft guideline*, October 2013, p. 25; PIAC, *Submission to the draft guideline*, October 2013, p. 29

620 See for example, APIA, *Submission to the draft guideline*, October 2013; ENA, *Response to the draft guideline*, October 2013.

621 For more discussion, see AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 54–72.

622 See, for example: S. Myers, *Estimating the cost of equity: Introduction and overview*, 17 February 2013; APA Group, *Submission on the draft guideline*, October 2013, p. 22.

623 For a discussion, see AER, *Explanatory statement to the draft rate of return guideline*, pp. 101–102.

624 AER, *Explanatory statement to the rate of return guideline*, December 2013, p. 71.

- Given the amount of material involved, this could increase the administrative burden on all stakeholders.

- Given required equity returns can only be estimated with a limited level of precision, greater reliance on complex econometric models may not be justified. In particular, there is often no consensus among experts on the appropriate method or assumptions to use in estimating the return on equity.[625] A similar observation can be made about the level of precision implied by applying quantitative weights. Quantitative weights add further to the level of complexity.
- The volume and nature of the material required to be considered in multi-model approaches limits their transparency. We consider this allows for material to be used multiple times in an opaque fashion, making it difficult to discern the impact of any one model. For example, in the draft Guideline, we observed that the ENA's proposed multi-model approach explicitly assigned one third weight to DGM estimates. However, it then assigned one third weight to the estimate of the average firm (which was derived by DGM estimates). While it assigned one sixth weight to each the SLCAPM and FFM, these models incorporated DGM estimates of the return on the market. We have seen this occur to a more moderate degree in the regulatory proposals. For instance, SFG currently places 25 per cent weight on its DGM estimate, but incorporates DGMs into the other models by giving it 50 per cent weight in its MRP estimates that are used in other models.[626]

A.1.2 Our use of models in the foundation model approach

We have taken the position that all material submitted must be considered by us and in that sense it is relevant material that we must have regard to. As such, in forming our estimate of the allowed return on equity, we have had regard to all the models that service providers have submitted to us. These include the SLCAPM, Black CAPM, FFM and DGM. These also include two alternative implementations of the SLCAPM (the Wright CAPM and a CAPM that uses long term historical parameter estimates). We have regard to these models section A.3 below.

When having regard to relevant evidence, we use our judgement to determine how we can best incorporate this evidence into our return on equity estimate. We do not consider this 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 that contributes to the achievement of the allowed rate of return objective.

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[625] 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.

[626] For example, see SFG, *The required return on equity: Initial review of the AER draft decisions: Note for ActewAGL, Ausgrid, Essential Energy and Endeavour Energy*, January 2015, pp. 42–44.

Having had regard to the SLCAPM, Black CAPM, FFM and DGM, and their respective strengths and limitations, we consider we can best incorporate this information in the following ways:

- While we recognise all models have strengths and weaknesses, we consider the SLCAPM to be the superior model before us for the purpose of estimating the allowed return on equity (see section A.3.1). Given this, we estimate the overall return on equity using the SLCAPM. However, recognising that all models have strengths and weaknesses, we use a wide range of evidence to carefully estimate its parameters. We also use a range of additional information to check if our return on equity estimate makes sense or requires adjustment.
- Having had regard to the material put before us on the Black CAPM, we are not satisfied that we would produce a robust estimate of the return on equity using this model. We formed this position recognising the additional practical difficulties in implementing this model, relative to the SLCAPM (see section A.3.3). Having had regard to material on the Black CAPM, we have also formed the view that there are merits in the theory underpinning the model. In particular, we consider this supports considering an adjustment to the SLCAPM return on equity estimate in relation to the equity beta to account for market imperfections.[627] We have had regard to this theory in choosing to take a conservative point estimate of the equity beta. Given our judgement was to incorporate the model's theoretical underpinnings rather than its estimates into our return on equity; we do not consider it necessary (or beneficial) to derive return on equity estimates using this model.
- Having had regard to the material put before us on the FFM, we do not consider this model would produce return on equity estimates that would contribute to the achievement of the allowed rate of return objective (see section A.3.2). Given this, we do not see merit in deriving return on equity estimates using a FFM. Further, there is no agreed best methodology for running the FFM or factor models in general.[628] Given this, there would be little point in attempting to run the model. Rather, this could potentially mislead stakeholders into considering we held a view (that we do not necessarily hold) on how the FFM should be parameterised.
- Having had regard to the strengths and limitations of DGMs, we consider DGM estimates of the MRP to be more robust than DGM estimates of the return on equity for energy networks (see section A.3.4). As such, we consider that our decision to apply DGMs to estimate the return on market is reasonable. It does not appear to us that NER clause 6.5.2(e)(1) indicates regard must be had to financial models for specifically estimating the overall return on equity. Where applicable (and depending on the model), it appears that financial models could be used at the parameter level or at the overall return on equity, return on debt or rate of return level. Further, we recognise our approach of using a DGM to estimate the

[627] AER, *Explanatory statement to the rate of return guideline*, December 2013, p. 86.

[628] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 15–17.

return on the market is similar to how SFG used its DGM in its reports for several service providers.[629]

A.2 Characterisation of the foundation model approach

Several service providers submitted responses that appeared to suggest our foundation model approach simply entailed applying the SLCAPM as a single formula without considering whether the final output was commercially realistic. For instance, this opinion appeared to be expressed in a short response by Grant Samuel.[630] Also, SFG submitted that our foundation model approach did not capture the AEMC's intent under the new rules. Specifically, SFG considered we did not have real regard to evidence that we treated as 'secondary'.[631] Similarly, two submissions from infrastructure investment groups considered our draft decisions in November 2014 placed too much reliance on the SLCAPM.[632]

These views mischaracterise our foundation model approach. As such, we provide clarification on how a range of material informed our return on equity estimate:

- We found that most equity beta estimates clustered around 0.5.[633] If we were to have applied the SLCAPM mechanistically, 0.5 would have been a reasonable equity beta estimate to have adopted. However, international estimates and the theory of the Black CAPM informed our selection of a point estimate of 0.7.
- If we were to have dismissed evidence from the DGM, the evidence before us would indicate choosing an MRP no greater than 6.0 per cent (see appendix C—MRP). Having relied on evidence from DGMs, we applied an MRP that was greater (50 basis points) than indicated by the other evidence before us. While SFG observed we have previously applied an MRP of 6.5 per cent under the old rules, this was only when there was heightened risk relating to the GFC. In the current market, all other information is indicating that GFC-related risk levels have, at least to some extent, subsided. Therefore, there would be no reason to expect we would apply an MRP any higher than 6.0 per cent if we were still applying the old approach.

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629 That is, both approaches use DGMs to directly estimate the return on the market, to use as an input for estimating the return on equity for the benchmark efficient entity. For SFG's approach, see SFG, *Share prices, the DDM and the cost of equity for the market and a benchmark energy network*, February 2015; SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 48; SFG, *Reconciliation of dividend discount model estimates with those compiled by the AER*, October 2013; SFG, *Dividend discount model estimates of the cost of equity*, June 2013.

630 Grant Samuel & Associates, *AER — Draft decision*, 12 January 2015.

631 SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, p. 5; SFG, Energex proposal attachment 39, p. 15; SFG, Ausgrid revised proposal attachment 7.04, pp. 27-40; SFG, *Estimating the required return on equity: Report for ENERGEX*, August 2014, p. 15.

632 RARE, *Submission to the AER on the NSW draft determinations*, 13 February 2015; Spark Infrastructure, *Submission on the AER's draft decision for NSEW electricity distributors*, 13 February 2015.

633 See appendix D—Equity beta; Henry, *Estimating β: An update*, April 2014.

- Given the parameters above, if we were to have applied the SLCAPM mechanistically, this would have produced an indicative return on equity of 6.55 per cent at the time of our draft decisions in November 2014.[634] As it was, we applied an indicative return on equity of 8.1 per cent.[635] We do not consider this difference of 155 basis points should be treated as a mechanistic application of one formula.
- We adopt a SLCAPM point estimate in this preliminary decision because we consider other information under the foundation model approach supported this point estimate. After applying the foundation model, and incorporating a range of information into it, we relied on a range of information to check that the final output would contribute to the achievement of the allowed rate of return objective. This information included comparisons to the Wright approach, return on debt, independent valuation reports, broker reports and other regulators' estimates (see step four in section 3.4.1 of attachment three). Given we formed the view that this information supported our return on equity estimate, we have no reason to expect that adjusting our return on equity point estimate would better contribute to the achievement of the allowed rate of return objective. If we had formed a different view, we would have adjusted our estimate appropriately. For the avoidance of doubt, we note that:
    - Categorising material as:
        - material considered at step three (material with a role of informing foundation model parameters), and
        - material considered at step four (material with a role of informing overall return on equity);

      does not imply that one category of material is afforded more weight than the other in informing our return on equity estimate. Rather, categorising material into step three or step four simply reflects our consideration of the role for the material that would best contribute to the achievement of the allowed rate of return objective given the relative merits of the material.
    - Sequential consideration of material does not imply the relative weight afforded to the material. In any process there must be a first step. The consideration of material at step three does not, simply by occurring earlier, limit the weight that can be placed on material subsequently considered at step four, nor does it bound the manner in which material can be considered at step four.

We are satisfied with the return on equity estimated under the foundation model approach. We recognise this is lower that what we applied in the previous regulatory control period. SFG observed that this lower estimate was driven by currently low risk free rates. We are satisfied with the risk free rate used in our foundation model. While the risk free rate varies over time, it still indicates the rate that other investments must

634 3.55% + 0.5 × 6.0% = 6.55%.
635 3.55% + 0.7 × 6.5% = 8.1%.

beat because this compensates investors for the time value of money.[636] If required equity returns do not move with the risk free rate, this implies investors require a change in the risk premium to offset this effect. We do not consider that such a definitive relationship is supported by evidence.[637] Further, market evidence like conditioning variables and debt market movements indicate that market conditions have been stabilising since the GFC.

In forming our decision, we have recognised that the SLCAPM has limitations (and other models, like DGMs, have strengths). These are highlighted in step two under section 3.4.1 of attachment three. After our detailed assessment, we decided to use the SLCAPM as our foundation model (section A.3 sets this out in detail). Given the information before us, we consider this to be reasonable and the choice of using the SLCAPM as the foundation model to be open to us. It appears that Grant Samuel considered our draft decisions in November 2014 ignored many of the SLCAPM's shortcomings.[638] However, we also note that Grant Samuel acknowledged, 'we appreciate that, in the final analysis, the AER may consider the SLCAPM to provide a superior foundation model for regulatory purposes'.[639] We hold this view for the reasons set out in this appendix (in particular, see section A.3.1).

A.3 Role of equity models

At the time we developed the Guideline, we assessed the merits of the SLCAPM, the Black CAPM, the FFM, and the DGM against the criteria set out in the Guideline. We developed these criteria to help use undertake an assessment that would contribute to the achievement of the allowed rate of return objective. Guided by our criteria, we determined the appropriate role for each model to ensure our estimate of the return on equity achieved the allowed rate of return objective.[640] We did not assess alternative (non-standard) versions of the SLCAPM separately against our criteria.

We developed the foundation model approach, utilising the SLCAPM as the foundation model, taking into account a range of considerations covered in the explanatory statement to the Guideline.[641] Most importantly, at the time we published the Guideline, we expected the application of the foundation model approach (using the SLCAPM as foundation model) to contribute to the achievement of the allowed rate of return objective.

Service providers have submitted further material in support of alternative uses for the models above. Having assessed this material, we have determined to continue using the SLCAPM as the foundation model. We have also determined to use the other

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636 McKenzie, Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, pp. 11–12.

637 For example, see Partington, *Report to the AER: Return on equity (updated)*, April 2015, pp. 72–75; AER, *Access arrangement final decision Envestra Ltd 2013-17, part 3,* March 2013, pp. 30–31.

638 Grant Samuel & Associates, *AER — Draft decision*, 12 January 2015, p. 2.

639 Grant Samuel & Associates, *AER — Draft decision*, 12 January 2015, p. 4.

640 AER, *Explanatory statement rate of return guideline*, 17 December 2013, p. 58.

641 AER, *Explanatory statement rate of return guideline*, 17 December 2013, pp. 54–56.

models as we indicated in the Guideline.[642] After assessing all of the material before us, we are satisfied that the roles in our Guideline and our reasons for those choices remain valid.

We have assessed the models against our assessment criteria in the explanatory statement to the Guideline.[643] We have not used these criteria determinatively; contrary to some service providers' views.[644] Rather, our overarching consideration in determining the use for models is what will contribute to the achievement of the allowed rate of return objective. For this preliminary decision we have assessed the non-standard (historically based) implementations of the SLCAPM against our criteria. We consider this is appropriate because they have fundamental differences to the standard forward looking specification of the SLCAPM.

We discussed the key reasons for our use of the different models in section 3.4.1 of this attachment. However, we discuss further considerations relating to each of the six models below.[645]

A.3.1 Sharpe–Lintner CAPM

The SLCAPM 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.[646]

As discussed in section 3.4.1 of this attachment, we consider the SLCAPM will, as the foundation model in our foundation model approach, result in a return on equity that contributes to the achievement of 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.[647] 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 the service providers' proposals and submissions on these proposals.[648]

The SLCAPM is the dominant model used to estimate firms' cost of capital by providers of capital to firms (that is, investors).[649] We consider the SLCAPM:

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642 AER, *Rate of return guideline*, 17 December 2013, p. 13.

643 AER, *Explanatory statement rate of return guideline*, 17 December 2013, pp. 24–30.

644 For instance, AGN, AusNet Services, CitiPower/Powercor, JGN, SAPN and United Energy raised this issue in, *Submission in relation to the first round of regulatory determination under the new rules* in 13 February 2015.

645 We repeat some material already set out in the reasons for our decision to provide context for the more detailed material covered in this appendix.

646 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.

647 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 10–14.

648 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.

649 See Brealey, Myers, Partington and Robinson, *Principles of corporate finance*, McGraw Hill Australia, 2007, p. 216.

- 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 model have been raised over many years, the model remains the dominant asset pricing model used for capital budgeting.[650] We consider the use of the SLCAPM, with reasonably selected input parameters, should ensure the allowed rate of return is commensurate with the benchmark entity's efficient financing costs. We consider cross checks on the return on equity, using other information as set out in this decision, also provide supporting evidence that the return on equity derived using the SLCAPM-based foundation model approach will contribute to the achievement of the allowed rate of return objective.

A substantial amount of the material commented on our conclusions and choice of SLCAPM as the foundation model. Generally, the service providers considered the SLCAPM was likely to provide downward biased estimates of the return on equity of the benchmark efficient entity.[651] The majority of other stakeholders supported the use of the SLCAPM as the foundation model.[652] However, a number of them submitted we

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650 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.

651 For revised proposals, see: ActewAGL, *Revised regulatory proposal*, January 2015, p. 427; Ausgrid, *Revised revenue proposal and preliminary submission*, January 2015, p. 194; Endeavour Energy, *Revised regulatory proposal*, January 2015, pp. 219–220; Essential Energy, *Revised regulatory proposal*, January 2015, p. 238; JGN, *Response to the AER's draft decision and revised proposal, Appendix 7.1 — Return on equity response*, February 2015, p. 2; TransGrid, *Revised revenue proposal*, January 2015, p. 115. Also see ActewAGL *Regulatory Proposal 2015-19 Subsequent regulatory control period*, 2 June 2014, p. 267; Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp. 80-84; Endeavour Energy, *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, pp. 119–126; Energex, *2015–20 regulatory proposal*, October 2014, pp. 156–160; Ergon Energy, *Regulatory proposal appendix C: Rate of return*, October 2014, pp. 125–130; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014*, pp. 105-112; JGN, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p. 2; SAPN, *Regulatory proposal 2015–20*, October 2014, pp. 316, 319; TasNetworks, Regulatory Proposal, 2014, p. 107; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p. 186.

652 CCP, *Submission on NSW DNSPs regulatory proposals 2014-19*, 15 August 2014, pp. 14–15; MEU, *Submission on TasNetworks' revenue proposal*, 8 Aug 2014, p. 36; EMRF, *Submission on DNSPs regulatory proposal*, 8 August 2014, p. 32.

should consider lowering our SLCAPM input parameters relative to those published with the Guideline.[653]

We do not agree with the service provider submissions to depart from the foundation model approach for the reasons stated in section 3.4.1 of this attachment. We do not agree with submissions to lower the input parameters from those published in the Guideline for the reasons set out in appendix C—MRP and appendix D—Equity beta. Our consultants supported both our use of the foundation model approach in the Guideline and the use of the SLCAPM as the foundation model.[654]

Submissions supporting the SLCAPM as the foundation model

The majority of stakeholders (other than service providers) supported using the SLCAPM as the foundation model.[655] However, a number of them submitted we should consider lowering our SLCAPM input parameters relative to those published with the Guideline.[656] Based on the empirical evidence from Professor Olan Henry's (Henry) 2014 beta report, several stakeholders proposed, that the equity beta should be below 0.7.[657] Table 3-29 summarises a number of these submissions.

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653 CCP, *Submission on NSW DNSPs regulatory proposals 2014–19*, 15 August 2014, pp. 15–17; MEU, *Submission on TasNetworks' revenue proposal*, 8 Aug 2014, pp. 32–34; Bell Bay Aluminium, *Submission on TasNetworks revenue proposal*, 8 Aug 2014, p. 3; Tasmanian Small Business Council, *Submission on TasNetworks revenue proposal*, 8 August 2014, p. 42; Norske Skog Paper Mills, *Submission on TransGrid's revenue proposal*, p. 8; Origin Energy, *Submission on DNSPs regulatory proposal (attachment 1)*, 8 August 2014, p. 1; EUAA, *Submission to TasNetworks' revenue proposal*, 8 August 2014, p. 8; EUAA, *Submission on TransGrid's revenue proposal*, 8 August 2014, pp. 8–9.

654 Handley, *Advice on return on equity,* 16 October 2014, p. 4; McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 9–14.

655 CCP, *Submission on NSW DNSPs regulatory proposals 2014-19*, 15 August 2014, pp. 14–15; MEU, *Submission on TasNetworks' revenue proposal*, 8 Aug 2014, p. 36; EMRF, *Submission on DNSPs regulatory proposal*, 8 August 2014, p. 32.

656 CCP, *Submission on NSW DNSPs regulatory proposals 2014–19*, 15 August 2014, pp. 15–17; MEU, *Submission on TasNetworks' revenue proposal*, 8 Aug 2014, pp. 32–34; Bell Bay Aluminium, *Submission on TasNetworks revenue proposal*, 8 Aug 2014, p. 3; Tasmanian Small Business Council, *Submission on TasNetworks revenue proposal*, 8 August 2014, p. 42; Norske Skog Paper Mills, *Submission on TransGrid's revenue proposal*, p. 8; Origin Energy, *Submission on DNSPs regulatory proposal (attachment 1)*, 8 August 2014, p. 1; EUAA, *Submission to TasNetworks' revenue proposal*, 8 August 2014, p. 8; EUAA, *Submission on TransGrid's revenue proposal*, 8 August 2014, pp. 8–9.

657 For example, CCP, *Submission on NSW DNSPs regulatory proposals 2014–19*, 15 August 2014, pp. 15–17; MEU, *Submission on TasNetworks' revenue proposal*, 8 August 2014, pp. 32–34; Bell Bay Aluminium, *Submission on TasNetworks revenue proposal*, 8 Aug 2014, p. 3; Norske Skog Paper Mills, *Submission on TransGrid's revenue proposal*, p. 8; Origin Energy, *Submission on DNSPs regulatory proposal (attachment 1)*, 8 August 2014, p. 1; EUAA, *Submission to TasNetworks' revenue proposal*, 8 August 2014, p. 8; EUAA, *Submission on TransGrid's revenue proposal*, 8 August 2014, pp. 8–9.

Table 3-29 Submissions supporting the SLCAPM

Stakeholder	Submission
AGL	AGL submitted with respect to the NSW distributors, we should enforce our Guideline as good regulatory principle because it seems to provide a realistic benchmark rate of return for a low risk, regulated monopoly asset.[658]
Bell Bay Aluminium	Submitted that while TasNetworks' proposed WACC is less than previously allowed and that TasNetworks has followed the Guideline, we should review the parameters in its revenue proposal. It particularly considered both the MRP and beta could be reduced (from 6.5 per cent and 0.7). It noted the Guideline indicated 6.0 per cent is more appropriate for the MRP and the equity beta has a range of 0.4 to 0.7.[659]
Business South Australia	'Business SA supports the AER adopting a foundation model, Sharpe Lintner CAPM, to determine SAPN's required return on equity and does not support SFG's approach which involves allocating arbitrary weights to each of the four models with an apparent bias towards the models which produce higher estimates'.[660]
Consumer Challenge Panel (CCP)	In developing its Guideline, the AER had regard to the NER, took into account feedback from extensive consultation, decided against using this model, and provided its reasons for this decision. The CCP could see no clear evidence from the distributors to support straying from the SLCAPM. They suggested we do not admit the FFM into our return on equity considerations.[661] The CCP also submitted, 'lower values for both market risk premium and equity beta than those chosen by the AER – 6.5% and 0.7 respectively - are plausible within the evidence that has been used by the AER, and that use of lower parameters would be in the better long term interests of consumers.'[662]
Energy Consumers Coalition of SA (ECCSA)	ECCSA considered that, when assessed in detail, SFG's report advocating the multi-model approach provides little information as to the underlying strengths and weaknesses of the different models other than SFG's views at a macro level. ECCSA observed: 'what is intriguing is that SFG provides the least weight to the model most commonly used in the financial advice sector and by most regulators worldwide. This weighting approach also ignores the fact that the S-L CAPM has been used in the energy regulation process in Australia for over 15 years and has allowed network owners to buy and sell networks at premiums well in excess of the regulatory asset base. This

658 AGL, *Submission on DNSPs regulatory proposals*, 8 August 2014, p. 19.

659 Bell Bay Aluminium, *Submission on TasNetworks revenue proposal*, 8 Aug 2014, p. 3.

660 Business SA, *SAPN regulatory proposal 2015-20*, January 2015, p. 30.

661 CCP, *Submission on NSW DNSPs regulatory proposals 2014–19*, 15 August 2014, pp. 14–15.

662 CCP, *Response to AER draft determination for TransGrid and TransGrid's revised revenue proposal*, February 2015, p. 7.

Stakeholder	Submission
	provides market evidence that the S-L CAPM is well proven to provide outcomes that are realistic'.[663]
Energy Markets Reform Forum (EMRF)	EMRF submitted that distributors have regurgitated arguments made during the Guideline development process and the conclusions drawn during this process have been effectively overlooked. It submitted that the distributors have provided no new information to justify the use of other models that might otherwise lead varying our assessment in the Guideline. EMRF did accept that new information had been submitted by TransGrid in the form of Grant Samuel's assessment of the valuation of Envestra.[664] With regards Grant's Samuel's report, EMRF does not consider it provides new information. Even if it did, EMRF submitted that we should consider this just another expert report. The EMRF considered the Guideline to be similar to what Australian regulators have used over the last 15 years, which has been lucrative for service providers — noting asset sales have been greater than the RAB.[665]
The Energy Users Association of Australia (EUAA)	EUAA submitted that while it was supportive of the Better Regulation program and the associated Guidelines, the return on investment is very generous for the low level of risk faced by network regulated businesses. The EUAA encouraged us to revisit some input parameters, particularly the MRP and the equity beta to provide a balanced point allocation within the parameter ranges mooted by us to date.[666]
Major Energy users (MEU)	MEU supported using an equity beta consistent with the median value (0.3285) in Henry's 2014 report.[667] MEU considered 'the Guideline approach results in a WACC that is still excessive when considering the risks faced by monopoly networks and the protections that the regulatory framework provides such as a revenue cap, pass through arrangements, contingent projects and potential to recover excess capital expenditure if it is established to be prudent and efficient'.[668] It also generally supported the AER's approach but noted the conservative bias of the AER in selecting its point estimates within the SLCAPM range. MEU submitted: 'The multi-model approach proposed by the NSPs is untested; it includes multiple assumptions, and provides very unstable and uncertain outcomes for consumers and investors alike. In the MEU's view, the NSPs approach will generally over compensate the networks and fail to satisfy the NEO…the AER has met the requirements under the rules for considering a variety of data and models as part of its RoR Guideline development process – having considered these, it is at liberty to

[663] ECCSA, *AER SA electricity distribution revenue reset SAPN application: A response*, December 2014, p. 78.

[664] EMRF, *Submission on DNSPs regulatory proposal*, 8 August 2014, pp. 34–35; EMRF, *Submission on TransGrid's regulatory proposal*, 8 August 2014, pp. 30–31.

[665] EMRF, *NSW electricity transmission revenue reset: AER draft decision and TransGrid revised proposal*, January 2015, p. 27.

[666] EUAA, *Submission to TasNetworks revenue proposal*, 8 Aug 2014, p. 8. EUAA also submitted its support for the Guideline in EUAA, S*ubmission to the SAPN revenue proposal (2015 to 2020)*, 30 January 2015, p. 13.

[667] MEU, *Submission on TasNetworks' revenue proposal*, 8 Aug 2014, pp. 33–34.

[668] MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 52.

Stakeholder	Submission
	exercise its discretion to use the models that it considers as “fit-for-purpose” including deciding not to use some models at all (such as the Fama French 3 Factor model)'.[669]
Norke Skog Paper mills	Norske Skog Paper mills submitted with respect to TransGrid, we should reduce our Guideline beta estimate from 0.7 to the median estimate in Henry's beta work published in 2014. It considered the median estimate from this work represents the most common equity beta value for firms in Australia operating under the Australian regulatory environment and therefore should be adopted.[670]
Origin Energy	Urged us to set SLCAPM input parameters at the bottom of ranges where these would more closely approximate the networks’ true funding costs TransGrid's and the NSW distributors' proposed rates of return appear excessive. This is given TransGrid is a monopoly under a revenue cap with a pass through mechanism, while the NSW distributors are providing an essential service with no volume risk and with a pass through mechanism.[671] ActewAGL also faces substantially lower risks than what would support its proposed return on equity of 10.71 per cent. ActewAGL is under a revenue cap and has an unders and overs mechanism and cost pass through provisions.[672] Origin Energy supported our return on equity estimate in the draft decision. It found that this, 'considers relevant material, provides certain and predictable outcomes for investors, aligns with stakeholder expectations and is consistent with the rate of return objective’. In applying our foundation model, Origin Energy found 'the AER has considered abroad range of relevant information to determine input parameter point estimates to be used to inform the overall return of equity'. It submitted, 'Origin does not agree that failure to adopt TransGrid’s approach would prevent it from recovering its efficient costs. Origin considers that the AER’s approach produces an estimate of the cost of equity that is consistent with historic regulatory decisions and reflects the efficient financing costs of a business exposed to the level of risk that applies to an Australian regulated business'.[673]
PIAC	PIAC submitted that the distributors ' approach (which is significantly different to the Guideline in the models used) varies from the relatively straightforward calculation of the forward looking SLCAPM and introduces considerable complexity and uncertainty.[674]
Queensland	Recommended using the SLCAPM modified for the observed upward bias in

669 MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 53.

670 Norske Skog Paper Mills, *Submission on TransGrid's revenue proposal*, p. 8.

671 Origin Energy, *Submission on TransGrid's revenue proposal*, 8 August 2014, p. 1; Origin Energy, *Submission on DNSPs regulatory proposal (attachment 1)*, 8 August 2014, p. 1.

672 Origin Energy, *Submission in response to ActewAGL 2014–19 Regulatory Proposal*, 20 Aug 2014, p. 4.

673 Origin Energy, *Submission to AER TransGrid draft determination*, 6 February 2015, pp, 5–6.

674 PIAC, *Submission on DNSPs regulatory proposal*, 8 August 2014, p. 74.

Stakeholder	Submission
Council of Social Service (QCOSS) and its consultant, ENGINEROOM	returns available to low beta stocks. QCOSS and ENGINEROOM submitted that empirical evidence from market studies supported the view that the market rewards low beta stocks over high beta stocks, which would justify setting a rate of return below the mid-point estimate. They agreed the SLCAPM is transparent, well supported by theory, and well-understood. QCOSS was concerned that the foundation model approach increases the complexity and uncertainty because it uses multiple models (the SLCAPM, Black CAPM, DGM, Wright approach). ENGINEROOM's advice to QCOSS suggested that the approach of using a range of models together was flawed because the models have conflicting conceptual bases and assumptions and are not compatible. Further, this increases scope for distributors to vary the weight that they put on models between regulatory periods.[675]
Tasmanian Minerals and Energy Council (TMEC)	TasNetworks and a market-based change to the risk free rate have driven the lower costs. The AER has not exercised its discretion to deliver an outcome which protects the interests of consumers and has selected estimates of the equity beta and MRP to benefit the service providers.[676]

Source: AER analysis of submissions.

We consider the submissions in Table 3-29 generally support our use of the SLCAPM 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 appendix C—MRP and appendix D—Equity beta.

Submissions not supporting SLCAPM as the foundation model

A number of service providers submitted that the allowed return on equity for a benchmark efficient entity from the foundation model approach (using the SLCAPM as a base model) is likely to be downward biased. In the regulatory proposals before us, service providers submitted that we should use different models and additional information to the information in the foundation model approach.[677] Several service providers also submitted these positions in their revised regulatory proposals and in their submissions on other service providers' revised regulatory proposals.[678] These

675 QCOSS, *Understanding the long term interests of electricity customers: Submission to the AER's Queensland electricity distribution determination 2015-2020*, 30 January 2015, pp. 76, 103–106.

676 TMEC, *Submission to the AER draft determination*, 6 February 2015, p. 1.

677 Energex, *2015–20 regulatory proposal*, October 2014, pp. 156–160; Ergon Energy, *Regulatory proposal appendix C: Rate of return*, October 2014, pp. 125–130; SAPN, *Regulatory proposal 2015–20*, October 2014, pp. 316, 319.

678 Revised proposals include Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, pp. 188–198;ActewAGL, *Revised regulatory proposal 2015–19*, January 2014, pp. 433–449; Endeavour Energy, *Revised regulatory proposal*, January 2015, pp. 212–224; Essential Energy, *Revised regulatory proposal*, January 2015, pp. 231–242; TransGrid, *Revised revenue proposal*, January 2015, pp. 113–115. Additionally, AGN, AusNet Services, CitiPower/Powercor, JGN, SAPN 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. For other

service providers appear to have submitted that the downward bias is due to improper consideration of relevant material in either:

- Using the foundation model approach, with the SLCAPM as a foundation model.[679]
- Forming a view on the appropriate parameter values to use in applying the foundation model approach. That is, values for the risk free rate, MRP and equity beta.[680] For example, Ausgrid, Endeavour Energy and Essential Energy (the NSW distributors) submitted we should consider return on equity estimates from the FFM and Black CAPM when setting the return on equity.[681] They also submitted that DGM estimates of the required return on equity are likely to improve estimates of the required return on equity.[682]

A number of service providers appear to have submitted, directly or implicitly, that the parameters we select for the SLCAPM under the foundation model approach are insufficient to overcome the downward bias in the SLCAPM. Service providers submitted this position in the initial proposals before us.[683] Several service providers also submitted these positions in their revised proposals.[684] The key information that service providers used to base these propositions on included:

- Studies of ex post performance of the SLCAPM.[685]
- Empirical and theoretical information related to the estimation of the SLCAPM input parameters (particularly in relation to equity beta).[686]
- Other direct estimates of the return on equity from alternative sources to the SLCAPM.[687]

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submissions, see ActewAGL, *Submission on the AER's draft decision: ActewAGL distribution determination*, 13 February 2015 (Public version); ENA, *AER draft decisions for NSW and ACT electricity distributors*, 13 February 2015; Ergon Energy, *Submission on the draft decisions: NSW and ACT distribution determinations 2015–16 to 2018–19*, 13 February 2015. Several service providers also submitted NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015.

679 ActewAGL, Energex, Ergon Energy, JGN, SAPN, TransGrid.

680 ActewAGL, Ausgrid, Endeavour Energy, Energex, Ergon Energy, Essential Energy, JGN, SAPN.

681 Ausgrid, *Revised revenue proposal and preliminary submission*, January 2015, p. 194; Endeavour Energy, *Revised regulatory proposal*, January 2015, pp. 219–220; Essential Energy, *Revised regulatory proposal*, January 2015, p. 238.

682 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp. 83–85; Endeavour Energy, *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, pp. 125–129; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp. 111–115.

683 Energex, *2015–20 regulatory proposal*, October 2014, pp. 157–158; Ergon Energy, *Regulatory proposal appendix C: Rate of return*, October 2014, p. 128; SAPN, *Regulatory proposal 2015–20*, October 2014, p. 319.

684 Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, pp. 188–198;ActewAGL, *Revised regulatory proposal 2015–19*, January 2014, pp. 433–449; Endeavour Energy, *Revised regulatory proposal*, January 2015, pp. 212–224; Essential Energy, *Revised regulatory proposal*, January 2015, pp. 231–242; TransGrid, *Revised revenue proposal*, January 2015, pp. 113–115.

685 For instance, several service providers recently submitted the consultant report, NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015.

686 For instance, several service providers recently submitted the consultant report, SFG, *Beta and the Black CAPM*, February 2015.

We have considered the key submissions on these points. We do not consider that they support any further adjustment to our SLCAPM input parameters to contribute to the achievement of the allowed rate of return objective. We are satisfied that our return on equity estimate would fairly compensate a benchmark entity facing a similar degree of risk to Energex for its efficient equity financing costs.

In addition to these submissions, Spark Infrastructure proposed removing the link between bond rates and the return on equity because long term infrastructure investors consider absolute returns, which they expect to be relatively constant.[688] In contrast, we are satisfied that equity prices move with changes in interest rates. Most approaches to estimating the return on equity require a risk free rate component.[689] These treat the expected return on equity as a risk premium over the risk free rate (which compensates investors for the time value of money). [690] We consider 10 year CGS yields are the most suitable proxy for the risk free rate.[691] We also recognise there is broad consensus with this positon.[692]

Bias and the SLCAPM as the foundation model

In their initial regulatory proposals, the majority of service providers submitted that the SLCAPM is downward biased for stocks with a beta of less than one.[693] To support this position, service providers submitted reports from CEG, SFG, and NERA.[694] A key

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687 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 CEG*, Estimating the cost of equity, equity beta and MRP*, January 2015; SFG, *The required return on equity for the benchmark efficient entity*, February 2015; SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015

688 Spark Infrastructure, *Submission on the AER's draft decision for NSW electricity distributors*, February 2015, p. 1.

689 The majority of financial models proposed by service providers include a risk free rate component. These include the SLCAPM, the Wright approach, the Black CAPM and the FFM. Further, the way service providers apply the DGM incorporates a risk free rate component.

690 M. McKenzie, and G. Partington, *Report to the AER: Supplementary report on the equity market risk premium*, 22 February 2012, pp. 11–12.

691 Gregory, *The risk free rate and the present value principle*, November 2012, p.5; Lally, *The present value principle*, March 2013, p. 10-12.

692 Lally, *The present value principle*, March 2013, p. 13; Wright, *Review of risk free rate and Cost of equity estimates: A comparison of UK approaches with the AER*, October 2012, p. 3; RBA, *Letter regarding the CGS market*, July 2012; Treasury and AOFM, *Letter regarding the CGS Market*, July 2012. Stakeholders also widely accepted this proxy during the Guideline development process. See ENA, *Response to the draft guideline*, October 2013, p. 30; APA Group, *Submission on the draft guideline*, October 2013, p. 23-24; NSW DNSPs, *Submission on the draft guideline*, October 2013, p. 18. Spark Infrastructure, *Response to the draft guideline*, October 2013, p. 4.

693 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p. 80; ActewAGL Distribution, *Regulatory Proposal 2015-19 Subsequent regulatory control period*, 2 June 2014, p. 262; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, p. 120; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p. 106; JGN, *2015-20 access arrangement information, appendix 9.03 Return on equity proposal*, 5 June 2014, p. 12; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p. 191.

694 Ausgrid, Endeavour Energy and Essential Energy submitted CEG, *WACC estimates: A report for NSW DNSPs*, May 2014. TransGrid submitted NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014. ActewAGL, Ergon Energy, JGN, TasNetworks and SAPN submitted SFG Consulting, *The required*

argument in these reports is that empirical tests of the SLCAPM reject the SLCAPM. These also show a relationship between beta (market risk) and realised returns that is flatter than the relationship predicted by the SLCAPM (using the long term government bond rate as a proxy for the risk free rate in the model).[695] Several service providers resubmitted this position in their revised regulatory proposals.[696] Further, in submissions to revised regulatory proposals and our draft decisions, several service providers submitted a NERA report on the empirical performance of the SLCAPM.[697] Apart from this, in substance, service providers submitted little new material since the Guideline development process, where we considered submissions around potential bias in the SLCAPM.[698] At this time, we conclude the evidence is unclear given the empirical limitation of the tests. Notwithstanding potential limitations with the model, we consider that our implementation of the model recognises any potential empirical limitations.

After receiving service providers' initial proposals, we engaged Associate Professor Graham Partington and Professor Michael McKenzie (McKenzie and Partington) to review these proposals and the expert reports submitted with them. We also engaged Associate Professor John Handley (Handley) do a high level review of our foundation model approach. This took into account Partington and McKenzie's report, the service providers' initial proposals, and three key expert reports that service providers submitted.[699] This analysis still applies to much of the material submitted to us after commissioning these reports. This is because:

- Ergon Energy and SAPN submitted the same SFG report that our consultants analysed.[700]
- Energex based its return on equity estimate on the methodology contained within this SFG report.[701]

return on equity for regulated gas and electricity network businesses, 6 June 2014. Energex submitted SFG, *Estimating the required return on equity*, 28 August 2014.

695 CEG, *WACC estimates: A report for NSW DNSPs*, May 2014, pp. 11–16 ; SFG Consulting, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon, Transend and SA Power Networks*, 6 June 2014, pp. 21–24; NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, pp. 82–84.

696 Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p. 189; ActewAGL, *Revised regulatory proposal*, January 2015, pp. 441–444; Endeavour Energy, *Revised regulatory proposal*, January 2015, p. 213; Essential Energy, *Revised regulatory proposal*, January 2015, p. 232. TransGrid maintained its position in its initial revenue proposal. See TransGrid, *Revised revenue proposal*, January 2015, p. 8.

697 NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015.

698 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 11–13.

699 The three expert reports Handley was asked to examine were CEG, *WACC estimates: A report for NSW DNSPs*, May 2014; SFG Consulting, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon, TasNetworks (previously Transend) and SA Power Networks*, 6 June 2014; NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014.

700 That is, SFG, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon and Transend*, May 2014.

701 SFG, *Estimating the required return on equity: Report for ENERGEX*, 28 August 2014.

- Service providers maintained their initial positions in their revised regulatory proposals.[702]
- Partington considered the material presented in the revised proposals and found:[703]

> In brief, our position is that none of the information and arguments presented in these reports would give us cause to change our previously stated position. That is to say, the findings of McKenzie and Partington (2014) would remain unaltered in light of these additional submissions.

In relation to the SLCAPM, McKenzie and Partington found the following:[704]

- 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 SLCAPM framework.
- 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.[705]
- The evidence against the SLCAPM 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.

McKenzie and Partington also considered that the Black CAPM was not based on more realistic assumptions. Further, they considered that the empirical results for the Black CAPM and SLCAPM were not directly comparable.[706]

Several service providers submitted an empirical test of the SLCAPM and the Black CAPM by NERA.[707] We observe that this material responds to the position we have

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[702] Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p. 189; ActewAGL, *Revised regulatory proposal*, January 2015, pp. 441–444; Endeavour Energy, *Revised regulatory proposal*, January 2015, p. 213; Essential Energy, *Revised regulatory proposal*, January 2015, p. 232. TransGrid maintained its position in its initial revenue proposal. See TransGrid, *Revised revenue proposal*, January 2015, p. 8.

[703] Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 12.

[704] McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 9–10.

[705] McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 9.

[706] McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 22–23.

[707] NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015.

held since the Guideline. However, we received this material in February 2015 — with JGN's revised access arrangement and with submissions on several revised regulatory proposals. Given the level of technical detail and when we received this report, we have not been able to consider and respond to specific econometric issues in depth. Notwithstanding this, we 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 SLCAPM or the Black CAPM.[708] NERA also provided an estimate of the zero-beta premium of 10.75 per cent.[709] It has been acknowledged that it is implausible for the zero beta premium to be equal to or greater than the MRP.[710] Further, having reviewed this report in relation to its results on the Black CAPM, Partington advised:[711]

> 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 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 and SFG restrict the choice by fitting a regression model to the data in order to obtain a single estimate.

Further, having considered this report (among other relevant material), Partington maintained the view that the foundation model does not provide a downwardly biased estimate in the current context. He also advised:[712]

> The theoretical justification for a downward bias has previously been considered in McKenzie and Partington (2012, p. 19-20) and they do not find in favour of this argument in this context. We also do not view the statistical justification (see SFG (2013a, p. 5), SFG (2014a, p. 10-12) for a discussion of the Vasicek adjustment) as valid in this context.

We consider the empirical information submitted in relation to the ex post performance of the different models does not show our application of the SLCAPM will undercompensate the benchmark efficient entity for it efficient cost of equity. The benchmark firm is not average risk and its risk is not expected to change given its regulated monopoly nature providing services with relatively inelastic demand.

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708 NERA, *Empirical performance of the Sharpe–Lintner and Black CAPMs*, February 2015, pp. 25, 31.

709 NERA, *Empirical performance of the Sharpe–Lintner and Black CAPMs*, February 2015, p. 29.

710 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.

711 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 25.

712 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 33.

Empirical evidence by Professor Henry supports this and shows no clear evidence of mean reversion of risk towards the average risk of the market (see appendix D—Equity beta). Partington also observed Henry's result in advising that a Vasicek adjustment was not valid. He advised:[713]

> 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)

McKenzie and Partington confirmed their view prior to the publication of the Guideline that the equity beta of the benchmark firm is likely to be very low. They considered issues that the service providers' consultants raised with their 2012 report as unfounded.[714]

McKenzie and Partington expressed that the foundation model approach, using the SLCAPM as the foundation model, would be expected to:[715]

- 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.

McKenzie and Partington noted that estimates from alternative models could be useful in triangulating the return on equity to the extent these are well founded, unbiased and appropriately combined.[716] However, they also stated that they 'have significant reservations about the implementations of the models as proposed by the network service providers'.[717] After considering service providers' revised proposals, Partington emphasised the dangers of simply combining information from different models. He advised, 'it cannot be taken for granted that a number is meaningful without fully understanding the context in which it is estimated'.[718]

Handley indicated that our use of the SLCAPM as foundation model was entirely appropriate and reasonable.[719] He noted: [720]

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713 Partington, *Report to the AER: Return on equity (updated), April 2015*, pp. 33–34.

714 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 10–13. For the 2012 report, see McKenzie and Partington, *Report to the AER: Estimation of the equity beta (conceptual and regulatory issues) for a gas regulatory process in 2012*, 3 April 2012.

715 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 13–14.

716 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 14.

717 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 9.

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

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

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

'[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.

Evidence from broker and valuation reports supported the views of Handley and McKenzie and Partington that the SLCAPM is the standard asset pricing model among market practitioners. All but one of the valuation reports we examined used the SLCAPM as the primary model for estimating the return on equity.[721]

Bias and our choice of SLCAPM parameters

We consider our SLCAPM parameters result in a return on equity that will contribute to the achievement of the allowed rate of return objective. This is for the following reasons:

- Our risk free rate proxy reflects the current conditions in the market for capital. It is also an unbiased estimator of the risk free rate that should be used in the SLCAPM (see section 3.4.1).
- Our MRP of 6.5 per cent is a fair estimate of the MRP having regard to all the information before us (see section 3.4.1 and appendix C–MRP).
- We have chosen an equity beta point estimate of 0.7 from the upper end of our estimated range. This estimate is with reference to a range of material considered on the basis of merit (see section 3.4.1 and appendix D–Equity beta).

We apply an equity beta of 0.7, which is above many of the equity beta estimates in Henry's 2014 report.[722] We recognise that McKenzie and Partington indicated the Black CAPM (of itself) does not justify any uplift to the estimated equity beta to be used in the SLCAPM.[723] Nevertheless, we consider this model theoretically demonstrates that market imperfections could cause the SLCAPM to generate return on equity estimates that are too high or too low. Therefore, we have taken this into account in exercising our regulatory judgment to use an equity beta of 0.7 in the SLCAPM. This is the equity beta set out in the Guideline.

The service providers' proposals currently before us, submissions and our consultants' advice, do not satisfy us that the SLCAPM will systematically underestimate the return on equity for the benchmark efficient entity. We set out our assessment against the assessment criteria in section 3.4.1 of attachment three.

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721 42 independent valuation reports dated between 27 April 2013 and 28 February 2015 contained a discounted cash flow analysis, but only five of these reports used another model (the dividend growth model) to estimate the return on equity. Four of these five reports used the alternate model as a cross-check on an initial SLCAPM-based estimate. The remaining report used the DGM to directly estimate the value of the proposed transaction (a return on equity estimate was an input into the DGM rather than an output).

722 Henry, *Estimating β: An update*, April 2014.

723 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24.

Conclusions with respect to the SLCAPM

Having considered the material before us and the advice from our consultants in relation to this material, we consider using the SLCAPM as our foundation model will result in a return on equity estimate that contributes to the achievement of the allowed rate of return objective. We consider the use of the SLCAPM as the foundation model will not result in a downward biased estimate of the return on equity for the reasons set out in this appendix (in particular, sections A.1 and A.3.1) .

While we acknowledge that the SLCAPM has weaknesses. We note:

- We remain of the view that the SLCAPM is the superior model to use as the foundation model (at this time). We agree with our consultants that the evidence against the model is far from clear.[724] However, we accept that if the application of alternative models became more robust, consistent, and widely accepted, then it might be appropriate to reconsider their role in the future.
- We have not applied the SLCAPM mechanistically with respect to the MRP or equity beta. Step three of our foundation model approach covers our selection of input values these parameters.
- We have applied the SLCAPM in a measured manner in choosing an equity beta above the best econometric estimate implied from Henry's 2014 report.[725] We note our beta of 0.7 is generally below the equity beta service providers and their consultants have proposed (typically between 0.82 and 0.94).[726] However, it is above the equity beta a number of stakeholders considered appropriate, given the risk of the service providers.[727]

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[724] Handley*, Advice on the return on equity*, 16 October 2014, pp. 4–5; McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 13–14

[725] Henry, *Estimating beta: An update*, April 2014.

[726] Directlink and TasNetworks proposed an equity beta of 0.7, consistent with the Guideline. Otherwise, equity beta estimates from service providers ranged from 0.82 to 0.94. The former is based on SFG's econometric estimate from SFG, *Equity beta: Report for JGN, ActewAGL and Networks NSW*, 12 May 2014. The latter is based on SFG's estimate using the risk premium implied from its DGM in SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2015.

[727] For some examples, see CCP, *Submission to TransGrid's revenue proposal*, August 2014, p. 7; CCP, *Submission to the NSW DNSPs' regulatory proposals*, August 2014, pp. 15–17;CCP, *Submission to TasNetworks' revenue proposal*, September 2014, p. 8; Bell Bay Aluminium, *Submission to TasNetworks' revenue proposal*, August 2014, p. 3; EMRF, *Submission to the NSW DNSPs' regulatory proposals*, July 2014, pp. 35–36; EMRF, *Submission to JGN's access arrangement proposal*, August 2014, pp. 71, 75–76; EMRF, *Submission to TransGrid's revenue proposal*, July 2014, p. 32; EUAA, *Submission to TransGrid's revenue proposal*, August 2014; EUAA, *Submission to TasNetworks' revenue proposal*, August 2014, p. 8; MEU, *Submission to TasNetworks' revenue proposal*, August 2014, pp. 33–34; Norske Skog, *Submission to TransGrid's revenue proposal*, p. 8; Nyrstar, *Submission to TasNetworks' revenue proposal*, August 2014, p. 2; Origin, *Submission to TransGrid's revenue proposal*, August 2014, pp. 1–2; Origin, *Submission to the NSW DNSPs' regulatory proposals*, August 2014, p. 7; PIAC, *Submission to the NSW DNSPs' regulatory proposals*, August 2014, p. 80; TSBC*, Submission to TasNetworks' revenue proposal*, August 2014, p. 42; UnitingCare, *Submission to the NSW DNSPs' regulatory proposals*, September 2014, p. 20; UnitingCare, *Submission to ActewAGL's regulatory proposal*, September 2014, p. 20. Also see appendix D–Equity beta.

We consider the SLCAPM is appropriate as a foundation model to use to estimate the return on equity of the benchmark efficient entity. 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. The key reasons for using the SLCAPM as our foundation model remain unchanged from the reasons in the Guideline. These include:[728]

- It is widely used for estimating the expected return on equity for regulated companies. This includes use by academics, market practitioners and other regulators.
- The SLCAPM, estimated as the sum of the risk free rate, and the product of the equity beta and MRP, is relatively simple to implement. We consider these input parameter estimates are based on robust, transparent and replicable analysis supports.
- Other relevant material can be used to inform the SLCAPM parameter estimates. This may mitigate limitations of the model. The approach, therefore, facilitates the inclusion of a broad range of material, but may still provide some certainty to stakeholders as to the final return on equity.
- The SLCAPM can be used to provide a range of estimates and a point estimate from within this range. This functionality provides further predictability to stakeholders regarding the final return on equity value.

A.3.2 Fama French Three Factor Model

The FFM is a three factor model of asset returns.[729] It incorporates the following three risk factors:[730]

- 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.

Based on the information before us when we published the Guideline, we determined we would give the FFM no role in estimating the return on equity for the benchmark efficient entity. We also maintain our reasons for this position as set out in the Guideline's explanatory statement and its appendices.[731] We do not consider that using

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728 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 13–14.

729 Fama, E.F., French, K.R., 'The cross section of expected stock returns', *The Journal of Finance*, 47, 1992, pp. 427–66.

730 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 15–16.

731 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.

the FFM will result in a return on equity estimate that contributes to the achievement of the allowed rate of return objective.

We maintain this position having reviewed service providers' initial and revised proposals, supporting documents and submissions on our draft decisions.[732] McKenzie and Partington also supported our decision to not use the model.[733] After reviewing the revised proposals and submissions, Partington did not alter this view.[734] We consider Handley's comments on the model also support our decision to not use the FFM.[735]

The key reasons for giving the FFM no role at the time of publishing the Guideline were:[736]

- There is little evidence of companies or regulators using the FFM to estimate the return on equity.
- Empirical implementation of the FFM is relatively complex and opaque. Also, its estimates are sensitive to the chosen estimation period and methodological assumptions. For instance:
    - Estimates of the value and size factors vary considerably. This suggests the model is not robust and is sensitive to different time periods and estimation methodologies.
    - The FFM is more complex to estimate than the SLCAPM as there are more input parameters to estimate.
- There is a lack of theoretical foundation for the factors and the instability of parameter estimates. The disappearance of the size effect may reflect the lack of theoretical foundations for the factors in the FFM.
- 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).

In its submission relating to the NSW distributors, the Consumer Challenge Panel (CCP) indicated they did not see any clear new evidence on the FFM relative to the material we considered when developing the Guideline. Consequently, they submitted

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732 Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, pp. 1–4; NERA, *Return on Capital of a Electricity Network*, May 2014, pp. 96–103; SFG, *The required return on equity for regulated gas and electricity network businesses*, 6 June 2014, pp. 33–37; SFG, *The Fama-French model*, May 2014, pp. 17–32; SFG, *Estimating the required return on equity*, 28 August 2014, pp. 83–87; SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015.

733 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 15–19.

734 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 12.

735 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, *Report prepared for the AER: Further advice on the return on equity*, April 2015, pp. 3–4.

736 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.

we should not use the FFM.[737] Similarly, Major Energy Users (MEU) considered we had met the rule requirements for considering a variety of data and models and we were at liberty to exercise our discretion to not use some models, such as the FFM.[738]

In the regulatory proposals before us, service providers argued that empirical estimates from the FFM should be used for estimating the return on equity.[739] Several service providers also submitted these positions in their revised proposals.[740] The service providers used their empirical estimates of the return on equity from the FFM to do one or more of the following:

- Estimate their proposed return on equity (as part of a multi model approach).[741]
- To provide 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.[742]
- To support the view that the foundation model approach as set out in the Guideline will not contribute to the achievement of the allowed rate of return objective.[743]

Service providers responded to our key reasons for giving the FFM no role at the time of the publication of the Guideline in their initial and revised proposals. These responses have been principally through reports by SFG and NERA and a short response by Professor Bruce Grundy.[744] The main responses to our Guideline's reasoning include:

- Our position that estimates are sensitive to the choice of estimation periods and methodological assumptions is not a valid reason to not use the model.[745] Regarding sensitivity, SFG and Grundy noted that the beta risk factor in the SLCAPM is also sensitive.[746]

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737 CCP, *Submission on the NSW DNSPs regulatory proposal 2014-19*, pp. 14-15.

738 MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 53.

739 Energex, *2015–20 regulatory proposal*, October 2014, pp. 164–165; Ergon Energy, *Regulatory proposal, appendix C: Rate of return*, October 2014, pp. 128–129; SAPN, *Regulatory proposal 2015–20*, October 2014, pp. 313–319.

740 Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p. 176; ActewAGL, *Revised regulatory proposal 2015–19*, January 2014, p. 468; Endeavour Energy, *Revised regulatory proposal*, January 2015, p. 213; Essential Energy, *Revised regulatory proposal*, January 2015, p. 216; JGN, *2015–20 access arrangement: Response to the AER's draft decision and revised proposal, Appendix 7.1 — Return on equity response*, February 2015, p. 38; TransGrid, *Revised revenue proposal*, January 2015, pp. 113.

741 ActewAGL, Energex, Ergon Energy, JGN, SAPN, TransGrid.

742 ActewAGL, Ausgrid, Endeavour Energy, Essential Energy, JGN, TransGrid.

743 ActewAGL, Ausgrid, Endeavour Energy, Ergon Energy, Essential Energy, JGN, SAPN, TransGrid.

744 Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, pp. 1–4; NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, pp. 96–103; SFG, *The required return on equity for regulated gas and electricity network businesses*, 6 June 2014, pp. 33–37; SFG, *The Fama-French model*, May 2014, pp. 17–32; SFG, *Estimating the required return on equity*, 28 August 2014, pp. 83–87; SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015.

745 SFG, *The Fama–French model*, May 2014, pp. 23–26.

746 SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2, 11–14l Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, p. 3.

- Our position that the model is relatively complex and opaque is not a valid reason to not use the model.[747] Even so, SFG and Grundy did not consider the FFM complex to implement.[748]
- We are incorrect in concluding there is little use of the FFM by companies to estimate their cost of capital, or by regulators to set their cost of capital.[749]
- Our position that the lack of theoretical foundation for the model suggests it may be unstable and may reflect the disappearance of the size effect are not clearly correct and/or valid reasons to reject the use of the model.[750] Further, theoretical justification for the FFM was developed after the model was developed, and this is standard for scientific progression.[751]
- Our position that even where factors are observed in ex-post realised returns, this does not mean the (historically observed) risk factors are priced ex-ante, is not a valid reason (of itself) to reject the use of the model.[752] Rather, SFG considered the FFM and SLCAPM shared the same purpose — to explain the cross-section of stock returns.[753] Grundy considered it unsafe to assume models that do not explain historical data will reliably explain future data.[754]

We are not satisfied with this reasoning. We set out our reasons for this position in the following sections.

Sensitivity

We consider the variation in estimates of the FFM indicates that these estimates are highly sensitive to the chosen methodology. As noted in section 3.4.1, a recent study in the UK by Michou, Mouselli and Stark (2014) reinforces this conclusion.[755] This study surveyed the research literature on the FFM and identified a variety of different methodologies used to estimate the FFM in the UK. The study found that different methodologies generated substantially different results. A principal conclusion of Michou, Mouselli and Stark was that the results of the FFM 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

747 SFG, *The Fama–French model*, May 2014, pp. 23–26.

748 SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2, 17–18; Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, p. 2.

749 SFG, *The Fama–French model*, May 2014, pp. 20–21; Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, p. 2.

750 SFG, *The Fama–French model*, May 2014, pp. 27–32. Further, Grundy considered the data do not support concluding that the size effect has disappeared: Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, p. 4.

751 SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2, 15–16; Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, pp. 3–4.

752 SFG, *The Fama–French model*, May 2014, pp. 26–27.

753 SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2, 14–15.

754 Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, p. 4.

755 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.

considered carefully in empirical settings'.[756] By adopting different methodologies, different experts come to substantially different findings.

We consider a critical limitation of the FFM is its lack of stability to specification and implementation choices. In addition to the work of Michou, Mouselli and Stark, the Australian work of Brailsford, Guant and O'Brien (2012) noted that regarding the FFM's specification choices around break points: 'what appears to be relatively innocuous choices in portfolio construction can lead to substantially different conclusions'.[757] Brailsford, Gaunt and O'Brien (2012) explained why their results were different from other studies which found a positive size premium in Australia. In particular, they drew attention to how their results depended on the specific methodology they used.

In contrast, we have a higher degree of confidence in our SLCAPM input parameters and resulting return on equity estimates from the SLCAPM. We have confidence in our proxy for the risk free rate (see section 3.4.1 of attachment 3); which would be the same if we were to apply the FFM. We are also satisfied with our estimates of the MRP and equity beta, which we provide detailed reasoning for in appendix C—MRP and appendix D—Equity beta. In particular, 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.[758] We acknowledge that the reasonable range these empirical estimates generate could be considered wide (0.4 to 0.7). However, we have regard to additional information and adopt an estimate at the top of this range.[759] Various consumer groups have characterised this as a conservative response, to the benefit of service providers.[760]

Regarding sensitivity, SFG considered all models requiring parameter estimates to be sensitive — including the SLCAPM.[761] While we recognise that all models can be sensitive, we are not satisfied that the sensitivity of the FFM is comparable to the SLCAPM. This is for the following reasons:

- SFG appears to suggest that the sensitivity arising from the SLCAPM arises from its one factor, the market factor. We have no reason to expect that adding arguably

756 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.

757 Brailsford, T., Guant, C., and O'Brien, M., 'The investment value of the value premium', *Pacific-Basin Finance Journal*, 20, 2012, p. 417.

758 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 49.

759 In appendix D—Equity beta, we recognised that an empirical equity beta range of 0.4 to 0.7 could be considered reasonable for the benchmark efficient entity. We adopted a point estimate of 0.7.

760 Bell Bay Aluminium, *Submission on TasNetworks revenue proposal*, 8 Aug 2014, p. 3.; CCP, *Response to AER draft determination for TransGrid and TransGrid's revised revenue proposal*, February 2015, p. 7; EUAA, *Submission to TasNetworks revenue proposal*, 8 Aug 2014, p. 8. EUAA also submitted its support for the Guideline in EUAA, Su*bmission to the SAPN revenue proposal (2015 to 2020)*, 30 January 2015, p. 13; MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 53; Norske Skog Paper Mills, *Submission on TransGrid's revenue proposal*, p. 8; TMEC, *Submission to the AER draft determination*, 6 February 2015, p. 1.

761 SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2, 11–14.

more sensitive factors (the size and value factors) would produce a model with a comparable level of sensitivity.

- McKenzie and Partington, having reviewed the service providers' proposals, indicated they do not consider we should use the FFM to estimate the return on equity. This is due to uncertainties that surround its use.[762] They considered the evidence indicated that the FFM was unlikely to produce empirically stable estimates. Further, the FFM does not have the ability to reliably estimate the required return on equity for a benchmark efficient entity.[763]
- Partington did not agree with SFG's submission that all models are sensitive to different estimation periods and methodologies. He advised:[764]

> 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.

In the Guideline, we found the FFM was relatively complex and opaque. Also, its estimates were sensitive to the choice of estimation periods and methodological assumptions. In response to this, SFG submitted the variation between FFM estimates arises because the studies that produce them are of different quality. We should only consider estimates from the best studies.[765] Further, NERA submitted:[766]

> [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.[767] While SFG argued that one methodology to estimating the FFM is superior to other methodologies, we disagree.[768] 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.[769] McKenzie and Partington also highlighted a vast array of models add further factors to the FFM. They pointed to one academic article that used over 50 variables to

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762 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 18.

763 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 18.

764 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 25.

765 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.

766 NERA, *The Fama–French Three–Factor Model A report for the ENA*, October 2013, p. 31.

767 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 18.

768 SFG, *The Fama-French model*, 13 May 2014, p. 24.

769 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 18.

predict stock returns, and another that showed over 330 different predictive return signals.[770] 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.[771]

Complexity

On our position that the FFM is complex to implement (relative to the SLCAPM), service providers submitted the following consultant views:

- SFG submitted, ‘the regulator would need to have regard to a relevant financial model even if it was complex’.[772]
- NERA submitted that the FFM produces a less precise estimate than the SLCAPM, ‘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 FFM should be considered given its relative lack of bias.[773]
- SFG and Grundy did not consider the FFM complex to implement because it simply required estimating three factors instead of the one factor in the SLCAPM.[774]

In response to these submissions on the relative complexity of the FFM, we have had regard to all financial models, irrespective of their level of complexity. 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 FFM provides a better estimate than the SLCAPM given the high degree of uncertainty around its estimates. We also do not consider the FFM will provide an unbiased estimate relative to the foundation model approach using the SLCAPM as the foundation model. This is because we consider there is no compelling evidence that our approach, as applied, will give a downward biased estimate of the return on equity.

We do not agree with SFG's and Grundy's most recent position that FFM is not complex to implement because it simply requires estimating three factors instead of the one factor in the SLCAPM.[775] Estimating the MRP and equity beta in the SLCAPM has resulted in a large amount of material being submitted by service providers, consultants and consumer groups.[776] This material adds a large amount of complexity

770 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 16–17.

771 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 16.

772 SFG, *The Fama-French model*, 13 May 2014, p. 23. They also argue that just because the FFM has more variables than the SLCAPM, this does not mean it is less accurate. For example, if aircraft flight times are affected by a number of variables, a model is not less accurate if it includes all the variables (pp. 23–24).

773 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.

774 Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, p. 2; SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2, 17–18.

775 SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2, 17–18.

776 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*

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.

Use in practice

SFG responded to our position in the Guideline that there is little evidence of companies and regulators using the FFM to estimate the return on equity. In particular, SFG submitted:[777]

- The background paper for the Nobel Prize awarded to Eugene Fama for his finance work stated that the FFM factors are now standard.
- The CFA certification includes extensive coverage of the FFM.
- Leading journals on financial economics continue to publish articles on the FFM.
- Survey evidence may be misleading. In addition, Grundy referenced a survey of CFOs where about 30 per cent of participants used a 'multi-beta CAPM'.[778]
- There are two examples of the FFM being used in US courts.
- Morningstar provides betas for the FFM. Grundy also submitted this.[779]

In response to these submissions, we note there is a distinction between the econometric application of the FFM by academics and the use of the FFM by practitioners. We accept that academics have applied different specifications of the FFM in an attempt to explain anomalies in realised return data relative to the ex-ante expected return predictions of the SLCAPM. That is, the FFM has been used as a theoretical factor model to econometrically fit realised return data. However, we recognise that this is a different purpose to an asset pricing model that stably predicts future expected returns and is used to systematically and stably price assets. McKenzie and Partington supported our views on the FFM's inability to stably predict returns and considered the parameter instability demonstrated in the literature to be symptomatic of its weakness.[780]

We maintain the view in the Guideline that regulators do not commonly use the FFM to estimate the rate of return. There is evidence that regulators, in particular, tend not to use the FFM. A recent study by Stephan Schaeffler and Christoph Weber examined

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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.

777 SFG, *The Fama-French model*, 13 May 2014, pp. 17–32.

778 Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, p. 2 references Graham, John R. and Cambell R. Harvey, 2001, 'The theory and practice of corporate finance: evidence from the field', *Journal of Financial Economics 60*, pp 187-243. 73.5% of respondents used the CAPM, and a proportion of CFOs used more than one method.

779 Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, p. 2.

780 McKenzie and Partington o, *Report to the AER part A: Return on equity*, October 2014, p. 18.

the regulatory practices in 21 countries. It concluded that the, 'standard model for determining capital costs' for energy businesses is the SLCAPM, finding that the FFM model is not used in regulatory decisions.[781] Partington advised, 'regulators have flirted with the use of the Fama and French model, but that has not encouraged its ultimate adoption in regulation'.[782] He agreed with the view expressed by Green, Lopez and Wang in relation to potentially using multi-factor models to update the US Federal Reserve's method of estimating the cost of equity for US banks. Green, Lopez and Wang found:[783]

> Multibeta models could be employed to calculate the equity cost of capital used in the PSAF. However, because there is no consensus on the factors, adoption of any particular model would be subject to criticism. Because the academic literature shows that multibeta models do not substantially improve the estimates, the gain in accuracy would likely be too small to justify the burden of defending a deviation from the CAPM. We therefore do not recommend using multibeta models to calculate the cost of equity capital in the PSAF. Nevertheless we present some numerical results based on the Fama and French (1993) model. These results indicate that any additional accuracy provided by multibeta models is clearly outweighed by the difficulties in specifying and estimating them.

We maintain the view in the Guideline that companies do not commonly use the FFM to estimate the rate of return. As part of reviewing the material service providers submitted, we examined 32 valuation (expert) reports completed in 2013 and 2014.[784] All but one of the broker and valuation reports we examined used the SLCAPM as the primary model. While eight of the 32 reports discussed the FFM, only four of these reports provided some somewhat arbitrary uplifts for the size factor. None of the reports provided any adjustment for the value factor. We consider this demonstrates that the FFM is not currently used widely, or in any determinative way, to value firms in

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781 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.

782 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 15.

783 Green, E.J., Lopez, J.A., Wang, Z., 'Formulating the imputed cost of equity capital for priced services at Federal Reserve banks, *Federal Reserve Bank of New York Economic Policy Review*, Vol. 9, No. 3, September 2003, p. 73.

784 32 independent valuation reports dated between 27 April 2013 and 31 July 2014 contained a discounted cash flow analysis, but only four of these reports used another model (the dividend growth model) to estimate the return on equity. Three of these four reports used the alternate model as a cross-check on an initial SLCAPM-based estimate. The remaining report used the DGM to directly estimate the value of the proposed transaction (a return on equity estimate was an input into the DGM rather than an output). See:
DMR Corporate, *Re: Independent Expert's Report, Report prepared for ILH Group Ltd*, 23 July 2013.
Grant Samuel & Associates Ltd, *Financial Services Guide and Independent Expert's Report in relation to the proposal by Murray & Roberts Holdings Ltd*, 11 October 2013.
Grant Samuel & Associates Ltd, *Financial Services Guide and Independent Expert's Report in relation to the proposal to internalise management*, 7 February 2014.
Grant Samuel & Associates Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-Committee in relation to the proposal by APA Group*, 4 March 2014.

Australia. We also do not consider this level of use justifies its empirical use given the other issues with the model.

We also note the FFM is just one of a family of 'factor models'. Factor models may include one or both of the size and value factors. They may also include a large number of other factors. In their early articles on the FFM, Fama and French argued that a central contribution of their research was that the two additional factors in the FFM captured the range of anomalies relative to the SLCAPM.[785] Subsequent research into factor modelling, however, has identified a variety of factors in addition to those in the FFM—including 'momentum' and a number of macroeconomic variables.[786] To the extent that the size and value factors are used, they are often used alongside a range of other factors. There appears to be no consensus, and, indeed, nothing approaching a consensus, on the appropriate factors to use in factor modelling. 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 largely inappropriate for determining the regulatory rate of return. Given the complexities, we do not consider (at this time) factor modelling will produce a suitably reliable estimate of the return on equity for regulatory use.

Morningstar's publication of FFM beta estimates, the CFA's teaching of the FFM, and the contents of the background paper for the Nobel Prize do not change our view on the use of the FFM. Morningstar, as with other data services, publishes a range of information for various reasons. This publication (of itself) does not indicate the information is widely used for pricing assets or is suitable for setting a regulated rate of return. Academic and vocational courses, of which the CFA is just one, teach a range of information for various purposes and reasons. The CFA covering the application of the FFM does not indicate that the model is widely used. Finally, the background paper to the Nobel Prize does not indicate the use of the FFM is 'standard' for pricing individual assets. The paper is clear that the award was for the Nobel Laureates' empirical contribution to the understanding of how asset prices are determined. It was not for developing an asset model that is generally accepted as correct.[787] The paper stated:[788]

> [a]lthough we do not yet have completed and generally accepted explanations of how financial markets function, the research of the Laureates has greatly improved our understanding of asset prices and revealed a number of important empirical regularities as well as **plausible** factors behind the regularities [emphasis added].

785 For example, see: Fama, E. F, and French, K. R., 'Multifactor explanations of asset pricing anomalies', *The Journal of Finance*, Vol. 51, No. 1, March 1996, pp. 55–88.

786 Cochrane, 'Presidential address: discount rates', *Journal of Finance*, Vol. 66, No. 4, August 2011, pp. 1047–1108.

787 Economic Sciences Prize Committee of the Royal Swedish Academy of Sciences, *Scientific Background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2013 Understanding Asset Prices*, 2013, p. 1.

788 Economic Sciences Prize Committee of the Royal Swedish Academy of Sciences, *Scientific Background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2013 Understanding Asset Prices*, 2013, p. 1.

We recognise that the paper indicated Morningstar publishes Alpha relative to the FFM factors and stated it has become standard to evaluate performance relative to 'size' and 'value' benchmarks. However, using these factors to evaluate investment performance is different to using the FFM to estimate the expected return on equity — which is our regulatory task. For example, Partington referenced Carhart et al. (2014) in advising that investors tend to view investment performance as an issue of portfolio management style, rather than reflecting risk factors.[789] With this in mind, the paper provided no compelling evidence that the FFM is widely used to price individual assets, or is suitable for setting regulatory rates of return.[790]

Ex ante returns

McKenzie and Partington consider that the FFM cannot be used for reliably estimating the return on equity at this time due to the uncertainties surrounding it.[791] However, they noted the FFM might be used (either alone or in combination with other models) to estimate the return on equity if the model was used appropriately and a number of the issues with the model were resolved.[792] They also 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'.[793]

The FFM estimates average returns in the cross section. We are not satisfied this 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 be genuinely priced in average returns in the cross section.[794] However, none of the possible reasons is commonly accepted.[795]
- 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

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789 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 15. Reference is made to Carhart, Carhart, M. M., 'On persistence in mutual fund performance', *Journal of Finance*, 1997, 52(1).

790 Alpha is the difference between the fair and expected rates of return on a stock. See: Body, Kane and Marcus, *Investments*, fifth edition, McGraw-Hill Irwin, p. 273.

791 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 18–19.

792 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 19.

793 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 18.

794 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.

795 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 skeptical appraisal of asset pricing tests', *Journal of Financial Economics*, 2010, 96, p. 175.

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 SLCAPM.

In the Guideline, we found it was unclear whether the FFM was estimating ex-ante priced risk factors. SFG responded to this by submitting, 'it is incumbent upon anyone using this argument to set out what level of empirical evidence would be required for them to consider that a particular factor might be relevant'.[796] We stress that our position on the FFM not clearly ex ante pricing risk factors is only one piece of evidence informing our regulatory judgment to not use the model. We have considered this in combination with the instability of the estimates from the model, the lack of clear theoretical foundations for the model, and the other evidence discussed above. We have also taken into account the limited empirical use of the model to price assets.

Theoretical foundation

In the Guideline, we stated the FFM lacked theoretical foundation. In response to this:

- SFG submitted the FFM can be embedded in a theoretical framework—either Merton's intertemporal CAPM or Ross's arbitrage pricing theory model.[797]
- NERA submitted that one can interpret the book-to-market ratio as a proxy for either (i) a financial distress risk factor (ii) a GDP growth risk factor (iii) the exposure to market risks.[798]
- While SFG conceded that the size factor was not persistent in the data, it emphasised that the value factor was persistent. Moreover, the persistence of the value factor provides a good reason to think the value factor has a theoretical foundation.[799] On the other hand, NERA maintained that both factors may be persistent, although noting the size premium is not statistically significant.[800] Grundy also considered the size effect appeared to have disappeared and returned.[801]
- NERA submitted it is legitimate to use a model that robust empirical evidence supports, even when you do not know the theoretical foundation. The FFM should not be impugned on the grounds that the empirical support for the model preceded theoretical developments.[802] SFG and Grundy also submitted this position.[803]

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796 SFG, *The Fama–French model*, 13 May 2014, p. 26.
797 SFG, *The Fama–French model*, 13 May 2014, p. 2.
798 The intuition for this third proxy is as follows: if a firm has a high book-to-market ratio, it tends to have a higher proportion of tangible assets, and to be more exposed in downturns.
799 SFG, *The Fama–French model*, 13 May 2014, p. 11–15.
800 NERA, *The market, size and value premiums: A report for the ENA*, June 2013, p. 91.
801 Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, p. 4.
802 SFG, *The Fama–French model*, 13 May 2014, pp. 28–29.
803 Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, pp. 3–4; SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 2, 15–16.

In response to the service providers' submissions, we do not agree that the Guideline simply dismissed the FFM because the theoretical arguments appeared after the empirical arguments. Rather, our concerns regarding the FFM arose because:[804]

- The parameters have proven to be somewhat unstable.
- The ex post theoretical explanations of the risk factors remain contested.
- That the FFM might be embedded in a theoretical framework does not change that the model was empirically motivated. Despite NERA's defence of the size effect, it appears to have disappeared in Australia.[805] SFG conceded this.[806] While Grundy considered the size effect reappeared, this appeared to be in reference to US equity market.[807] Further, this does not appear consistent with other empirical evidence that service providers have put before us.[808] Moreover, estimates of the value factor also change in magnitude over time.[809] In addition, while the FFM could be genuinely pricing risk (in the cross section at least), there is no consensus that it is. Even if it was, there is no consensus on what priced risk the non-market factors are actually capturing.

McKenzie and Partington also pointed to academic literature that supported our view that the theoretical basis of a model is an important consideration in determining the value to attribute to empirically based estimates. This literature indicated that a higher degree of empirical certainty may be warranted where there is less of a theoretical basis for the result.[810]

Overall conclusions with respect to the FFM

For the reasons discussed above, we do not consider the FFM is currently suitable for our regulatory task including:

- estimating the return on equity on the benchmark efficient entity
- performing a cross check on whether other models (including the SLCAPM) are producing reasonable estimates of the return on equity that will lead to an allowed rate of return that will meet the allowed rate of return objective.

We consider the use of the FFM will not contribute to the achievement of the allowed rate of return objective. We do not consider its use will be in the long term interests of consumers.

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804 See, for example, Lakonishok, Josef, Andrei Shleifer and Robert Vishny (1994), 'Contrarian Investment, Extrapolation and Risk', *Journal of Finance*, 49(5), pp. 1541–78. This article was cited in the background paper for Fama's Nobel Prize.

805 NERA, *The market, size and value premiums A report for the ENA*, June 2013, p. 91.

806 SFG, *The Fama-French model*, 13 May 2014, p. 15.

807 Grundy, *Letter to CFO, Networks NSW*, 9 January 2014, p. 4. Grundy references Fama, E.F., French, K.R. 2004, 'The capital asset pricing model: Theory and evidence', *Journal of Economic Perspectives* 18(3), pp. 25-46.

808 SFG, *Using the Fama–French model to estimate the required return on equity*, February 2015, p. 28.

809 SFG, *The Fama–French model*, 13 May 2014, p. 36.

810 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 17.

In response to service providers' submissions on the FFM, we consider the material before us does not justify the use of the FFM in our regulatory context. As explained above and in section 3.4.1, there are numerous specifications of the FFM that produce different estimates of the return on equity. Further, there is no single correct application. 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 the benchmark efficient entity even if they were capable of estimating required returns for the average firm. We do not consider the empirical estimates of the return on equity from the FFM appropriate for setting or assessing regulatory returns on equity capital. This is because of the limitations stated above, in section 3.4.1 and in the explanatory statement to the Guideline.[811] We also do not consider service providers' return on equity estimates using the FFM provide any compelling evidence that our SLCAPM estimate of the required return on equity is downward biased, or that our return on equity will not contribute to the achievement of the allowed rate of return objective.

Finally, while we have not used the model for this decision, we acknowledge that the model might be suitable for regulatory use in the future if the key issues with the model could be overcome. However, we consider this is unlikely in the near term given the discussion above and the issues still facing the model over 20 years since it was developed.

A.3.3 The Black CAPM

Fischer Black developed a version of the CAPM with restricted borrowing (the Black CAPM).[812] Black's model relaxes one of the key assumptions of the SLCAPM — 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 SLCAPM assumption of unlimited borrowing and lending at the risk free rate, in its place he assumes investors can engage in unlimited short selling.[813] Unlimited short selling does not hold in practice either.[814]

In the place of the risk free asset in the SLCAPM, 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 in the SLCAPM). Further, in the CAPM (security market line) equation, Black finds the expected return on the

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811 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 18–23.

812 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.

813 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 22.

814 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.

zero beta portfolio replaces the risk free asset.[815] Relative to the SLCAPM that can utilise observable proxies for the risk free rate, the Black CAPM requires estimating an additional parameter — the zero beta expected return.

At the time we published the Guideline, based on the information before us, we determined:

- We would use the theory behind the Black CAPM to inform the equity beta estimate in the SLCAPM.
- We would not use the Black CAPM to empirically estimate the return on equity for the benchmark efficient entity.

In the Guideline, we set out our reasons for limiting the role of the Black CAPM to using the theory behind it to inform our estimate of the equity beta.[816] We maintain these reasons, having fully reviewed the criticisms in the service providers' initial proposals and supporting documents.[817] We have also reviewed the service providers' revised proposals, supporting documents and submissions.[818]

Our use of the Black CAPM in our foundation model approach is due to the following:

- The empirical implementation of the Black CAPM is unreliable because:
    - in contrast to the risk-free rate, the return on the zero beta asset is unobservable
    - methods for estimating the zero-beta asset are unreliable.
- We consider NERA's 2012 submission to us illustrated the unreliability of the Black CAPM. This presented estimates of a Black CAPM that implied a negative MRP.[819]

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[815] Black, F., 'Capital market equilibrium with restricted borrowing', *The Journal of Business*, 45(3), 1972, pp. 446–450.

[816] AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 16–18, 68–77.

[817] For service providers' proposals on the Black CAPM see. ActewAGL, *Regulatory proposal 2015-19 Subsequent regulatory control period*, 2 June 2014, pp. 261–276; Ausgrid, *Regulatory proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp. 79–84; Endeavour Energy, *Regulatory proposal 1 July 2015 to 30 June 2019*, 30 May 2014, pp. 119–126; Energex, *2015–20 regulatory proposal*, October 2014, pp. 164–165; Ergon Energy, *Regulatory proposal, appendix C: Rate of return*, October 2014, pp. 122–123, 128–131; Essential Energy, *Regulatory proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp. 104–112; JGN, *2015-20 access arrangement information*, *appendix 9.03 Return on equity proposal*, 5 June 2014, pp. 1–2; SAPN, *Regulatory proposal 2015–20*, October 2014, p. 319;TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp. 12–13, 188–191. For supporting documents, see McKenzie and Partington analysed — SFG, *Cost of equity in the Black capital asset pricing model*, May 2014; SFG, *The required return on equity for regulated gas and electricity network businesses,* May 2014; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014.

[818] Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p. 176; ActewAGL, *Revised regulatory proposal 2015–19*, January 2014, p. 468; Endeavour Energy, *Revised regulatory proposal*, January 2015, p. 213; Essential Energy, *Revised regulatory proposal*, January 2015, p. 216; TransGrid, *Revised revenue proposal*, January 2015, p . 113. Also see NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015; SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015, pp. 11–17; SFG, *Beta and the Black CAPM*, February 2015.

[819] 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.

- There is little evidence that other regulators, academics or market practitioners use the Black CAPM to estimate the return on equity.[820] In particular, regulators rarely have recourse to the Black CAPM.[821]
- Using a conservative estimate of beta in the SLCAPM can accommodate potential issues that arise from not estimating the Black CAPM.[822]

We discussed many of the issues facing the Black CAPM during the Guideline development process.[823] In the initial proposals before us, service providers submitted that empirical estimates from the Black CAPM should be used for estimating the return on equity.[824] Several service providers also submitted this position in their revised proposals.[825] Service providers then used their empirical estimates of the return on equity from the Black CAPM to do one or more of the following:

- To estimate their proposed return on equity (as part of a multi model approach).[826]
- To provide 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.[827]
- To provide evidence that the foundation model approach as set out in the Guideline will not contribute to the achievement of the allowed rate of return objective.[828]

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820 See, AER, *Explanatory statement to the rate of return guideline (appendices)*, 17 December 2013, p. 17; AER, *Final decision: Envestra access arrangement*, June 2011, p. 40; Handley, *Advice on the return on equity*, 16 October 2014, p. 12. As part of reviewing the material service providers submit in support of their claims, we examined 32 valuation (expert) reports completed in 2013 and 2014 — none of which used the Black CAPM. NERA now appears to have accepted that the Black CAPM is not a well-accepted model adopted by market practitioners. See NERA, The Fama-French Three-Factor Model A report for the Energy Networks Association, October 2013, p. 41; NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 92.

821 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.

822 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.

823 See AER, *Explanatory statement to the rate of return guideline (appendices)*, 17 December 213, pp. 16–18, 68–77.

824 Energex, 2015–20 regulatory proposal, October 2014, pp. 164–165; Ergon Energy, *Regulatory proposal, appendix C: Rate of return*, October 2014, pp. 122–123, 128–131; SAPN, Regulatory proposal 2015–20, October 2014, p. 319.

825 Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p. 176; ActewAGL, *Revised regulatory proposal 2015–19*, January 2014, p. 468; Endeavour Energy, *Revised regulatory proposal*, January 2015, p. 213; Essential Energy, *Revised regulatory proposal*, January 2015, p. 216; TransGrid, *Revised revenue proposal*, January 2015, p . 113.

826 ActewAGL, Energex, Ergon Energy, JGN, SAPN, TransGrid.

827 ActewAGL, Ausgrid, Endeavour Energy, Essential Energy, JGN, TransGrid.

828 ActewAGL, Ausgrid, Endeavour Energy, Ergon Energy, Essential Energy, JGN, TransGrid.

In support of using empirical return on equity estimates from the Black CAPM, service providers appear to have criticised a number of key reasons in the Guideline for limiting the role of the Black CAPM to informing the equity beta.[829] These responses include the following:

- While SFG recognised that estimates of the zero beta premium can be imprecise, it considered that this was not (in itself) a good reason to assume there is no zero-beta premium.[830]
- SFG criticised us for not placing reliance on a 'plausible' estimate of the zero beta premium simply because we considered different approaches produced implausible estimates.[831]
- SFG implied that regulators and market practitioners used the Black CAPM in substance, but not in name. This is because, in substance, an SLCAPM with an intercept above the contemporaneous risk free rate is consistent with the Black CAPM.[832]
- SFG submitted we should estimate the Black CAPM to be transparent about how we have regard to it and to be 'true to' the models.[833]
- NERA indicated that the SLCAPM suffered from low beta bias, but also indicated that neither the Black CAPM nor the SLCAPM performed well empirically.[834]

Having considered these submissions, we remain satisfied with our position in the Guideline and draft decisions in November 2014. We consider the sensitivity of the Black CAPM to implementation choices, combined with its lack of use, largely makes it unsuitable for estimating the return on equity for the benchmark efficient entity at this time. We do not consider estimates under the Black CAPM would result in a return on equity that contributes to the achievement of the allowed rate of return objective. We elaborate on our reasons for this positon in the following sections.

Empirical reliability

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:[835]

829 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 8, 68–73.
830 SFG, *Beta and the Black CAPM*, February 2015, pp. 7–8.
831 SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015, pp. 12–13; SFG, *Beta and the Black CAPM*, February 2015, pp. 19–20.
832 SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015, pp. 13–14; SFG, *Beta and the Black CAPM*, February 2015, pp. 20–21.
833 SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015, pp. 14–17; SFG, *Beta and the Black CAPM*, February 2015, pp. 21–24; SFG, *Beta and the Black CAPM*, February 2015, p. 4.
834 NERA, *Empirical performance of Sharpe–Lintner and Black CAPMs*, February 2015.
835 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 91.

- 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:[836]

> 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 MRP. However, NERA claimed the result simply reflects that there is no relationship between systematic risk and return.[837] Handley described this as, 'NERA offers what it believes to be a plausible explanation for an apparently implausible result'.[838] Similarly, SFG submitted that imprecise estimates of the zero beta premium arose from the imprecision in the relationship between beta and stock returns.[839]

SFG acknowledged that one might expect the zero beta return to lie below the expected return on the market.[840] SFG estimated a somewhat more plausible estimate of the zero beta premium of 3.34 per cent per annum.[841] It then attempted to reconcile its estimate with NERA's and stated:[842]

> 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. 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. SFG later characterised this logic as not placing reliance

836 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 91.
837 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 92.
838 Handley, *Report prepared for the AER: Further advice on the return on equity*, April 2015, p. 6.
839 SFG, *Beta and the Black CAPM*, February 2015, p. 8.
840 SFG, *Cost of Equity in the Black Capital Asset Pricing Model*, 22 May 2014, p. 3.
841 SFG, *Cost of Equity in the Black Capital Asset Pricing Model*, 22 May 2014, p. 3.
842 SFG, *Cost of Equity in the Black Capital Asset Pricing Model*, 22 May 2014, pp. 3–4.

on a 'plausible' estimate simply because different approaches produced implausible estimates.[843] Having reviewed SFG's report, Partington advised:[844]

> 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 estimates represent.

In the Guideline, we found that estimates from the Black CAPM were unreliable because:

- In contrast to the risk free rate, zero beta returns are not observable.
- There is no reliable method to obtain an estimate of the zero beta return.

In response, NERA submitted several responses to the sources of unreliability identified in McKenzie and Partington (2012).[845] Nothing has overcome the issues with the stability of the model. We also question the validity of applying an asset pricing model that prices assets on the basis of equity beta where one does not consider there is a relationship between equity beta and required return.

McKenzie and Partington also considered NERA's submissions and remained of the view that the model is empirically unstable. They stated:[846]

> 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

Use in practice

We have found no evidence of Australian market practitioners using the Black CAPM.[847] A recent study by Stephan Schaeffler and Christoph Weber, which examined regulatory practices in 21 countries, concluded that the 'standard model for determining capital costs' for energy businesses is the SLCAPM.[848] Moreover, the study did not point to any uses of the Black CAPM. In addition, despite pointing to a report by the Brattle Group indicating two examples of regulators using the Black

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843 SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015, pp. 12–13; SFG, *Beta and the Black CAPM*, February 2015, pp. 19–20

844 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 12.

845 NERA, *Estimates of the Zero-Beta Premium: A report for the ENA*, June 2013.

846 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24.

847 As part of reviewing the material service providers submit in support of their claims, we examined 32 valuation (expert) reports completed in 2013 and 2014. As discussed above, all but one of the broker and valuation reports we examined used the SLCAPM as the primary model. None of the reports examined used the Black CAPM.

848 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.

CAPM, NERA now appears to have accepted that the Black CAPM is not a well-accepted model adopted by market practitioners.[849]

In contrast, SFG implied that regulators and market practitioners used the Black CAPM in substance, but not in name. SFG considers, in substance, an SLCAPM with an intercept above the contemporaneous risk free rate is consistent with the Black CAPM.[850] We could be inclined to accept this position if regulators' and market practitioners' use of uplifts were stated or known to be motivated by Black CAPM theory. However, we are not aware of any circumstance where this was the motivation.[851] We also observe this is a curious position given SFG also advocated for estimating the Black CAPM and considered that using the theory underpinning the Black CAPM to inform equity beta estimate was 'not being true to either model'.[852]

Use in the foundation model

Our consultants, McKenzie and Partington, reviewed the service providers' initial proposals and supporting documents relating to the Black CAPM.[853] Partington did not find the material in the revised proposals would convince him to depart from the positions in McKenzie and Partington's 2014 report.[854] As discussed in section 3.4.1, McKenzie and Partington indicated with respect to the Black CAPM:

- The model is not based on more realistic assumptions than the SLCAPM. The Black CAPM cannot be directly compared to the SLCAPM as they each involve very different investment strategies.[855] As such, any attempt to compare the Black CAPM and SLCAPM must be done with great care.[856]
- While the model might be used for estimating the return on equity for the benchmark efficient entity, it can be very sensitive to implementation choices.[857]

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849 NERA, The Fama-French Three-Factor Model A report for the Energy Networks Association, October 2013, p. 41; NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 92.

850 SFG, *The required return on equity: Initial review of the AER draft decisions*, January 2015, pp. 13–14; SFG, *Beta and the Black CAPM*, February 2015, pp. 20–21.

851 42 independent valuation reports dated between 27 April 2013 and 28 February 2015 contained a discounted cash flow analysis. None of these reports estimated the Black CAPM and zero reports referred to low beta bias. Only one non-Grant Samuel report included an uplift due to the risk free rate being low at the time.

852 SFG, *Beta and the Black CAPM*, February 2015, p. 23.

853 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 20–25. We engaged McKenzie and Partington before we received regulatory proposals from Energex, Ergon Energy and SAPN. However, these service providers submitted material on the Black CAPM that McKenzie and Partington considered in their report. For instance, Ergon Energy and SAPN submitted SFG, *Cost of equity in the Black capital asset pricing model*, May 2014. Energex submitted a new report that included material on the Black CAPM — SFG, *Estimating the required return on equity*, 28 August 2014, pp. 76–79, 83. However, this material was similar to that already analysed from SFG, *The regulated return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 25–27, 92–95.

854 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 12.

855 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 22–23.

856 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 17.

857 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*, p. 12.

- They would not recommend using the service providers' estimates from the Black CAPM to inform the equity beta given the practical difficulties with implementing the model.[858]
- The model (of itself) does not justify any uplift to the equity beta.[859]

Handley also considered the Black CAPM in his reports.[860] We consider his report also supported our decision to not use empirical estimates from the model. He noted with respect to the model:

- It is not widely used in practice. This is because the estimation of the zero beta rate, which can fall anywhere below the expected return on the market, is a non-trivial task.[861]
- 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.[862]
- It is unclear that low beta bias is a priced risk not already captured by the SLCAPM.[863] Handley later reiterated that our understanding of the low beta bias is still far from clear.[864]
- NERA's results that the zero beta premium equals the MRP has 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.'[865]

We agree with McKenzie and Partington that the Black CAPM (of itself) does not justify an uplift to the equity beta in the SLCAPM.[866] 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 SLCAPM-based estimate. We consider this a relevant consideration in selecting the equity beta.

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858 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24.

859 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24.

860 Handley, *Advice on return on equity,* 16 October 2014, pp. 9–12; Handley*, Report prepared for the AER: Further advice on the return on equity*, April 2015, pp. 5–6.

861 Handley, *Advice on return on equity,* 16 October 2014, p. 12.

862 Handley, *Advice on return on equity,* 16 October 2014, p. 10.

863 Handley, *Advice on return on equity,* 16 October 2014, p. 11.

864 Handley*, Report prepared for the AER: Further advice on the return on equity*, April 2015, p. 6.

865 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.

866 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24.

Overall conclusions with respect to the Black CAPM

For the reasons discussed above, we do not consider empirical estimates from the Black CAPM are currently suitable for our regulatory task. These are unsuitable for:

- estimating the return on equity for the benchmark efficient entity
- performing a cross check on whether other models (including the SLCAPM) are producing reasonable estimates of the return on equity that will contribute to the achievement of the allowed rate of return objective.

We consider the theory behind the Black CAPM demonstrates that an uplift to the raw equity beta estimate may be appropriate due to potential concerns around market imperfections impacting on the SLCAPM. However, consistent with the advice from McKenzie and Partington, we now do not consider it justifies any given uplift (of itself).[867]

See the section 3.4.1 of this attachment for our assessment of the Black CAPM against our assessment criteria.

A.3.4 Dividend Growth Model

DGMs use forecast dividends of businesses 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.

In the Guideline, we determined we would limit the use of DGMs (based on market wide dividend estimates) to informing the MRP in the SLCAPM.[868] We also indicated we would not use a DGM to estimate the required return on equity on individual network businesses.[869]

The key reasons in the Guideline for limiting the use of the DGM to estimating the MRP included:

- We considered a sufficiently robust data series existed for estimates of dividend yields for the Australian market. Whereas, we did not consider sufficiently robust data existed to form robust estimates of the required return on equity for Australian energy network service providers.[870] We noted there were difficulties with constructing credible datasets for implementing industry specific DGMs.[871] We also noted there were not enough Australian businesses to perform DGMs on individual businesses.[872]

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867 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 24.

868 AER, *Rate of return guideline*, 17 December 2013, p. 13.

869 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 14–17.

870 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 15.

871 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 77.

872 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 119.

- We considered there were methods for estimating the growth rate of dividends for the Australian market. Whereas, we considered it was unclear if a sufficiently robust method for estimating the dividend growth rate for Australian energy networks had been developed. We noted this was particularly the case for estimating the long term dividend growth rate.[873]
- We also considered that the sensitivity of DGMs to input assumptions would limit our ability to use a DGM as the foundation model. For example, estimates of simple DGMs (such as those previously proposed by CEG) have provided implausible estimates of the return on equity for the benchmark efficient entity.[874] For example, in the Guideline we found that simple DGMs generated average returns on equity for energy infrastructure businesses over an extended period that significantly exceeded the average return on equity for the market. This did not make sense as the systematic risk of network businesses is less than the overall market.[875]

The majority of service providers proposed using empirical estimates from the DGM to inform the overall return on equity.[876] The majority of service providers also supported SFG's approach to estimating the return on equity for the benchmark efficient entity using a DGM. [877] SFG's approach entails applying the following steps:

1. Estimate the return on equity for network businesses using the DGM for each of the analyst forecasts. Then, subtract the risk free rate to obtain the equity risk premium (ERP) for each return on equity estimate.
2. Determine the risk premium ratios by dividing each of the ERPs from step one by the relevant MRP from the DGM.[878]
3. Take a simple average of the risk premium ratios (determined in step two) to derive an average risk premium of 0.94.[879]

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873 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 15.

874 For example, see CEG, *Internal consistency of the risk free rate and MRP in the CAPM*, 30 March 2012, p. 50.

875 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 120–122.

876 For revised proposals, see Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p. 176; ActewAGL, *Revised regulatory proposal 2015–19*, January 2014, p. 468; Endeavour Energy, *Revised regulatory proposal*, January 2015, p. 213; Essential Energy, *Revised regulatory proposal*, January 2015, p. 216; TransGrid, *Revised revenue proposal*, January 2015, p . 113. Also see TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p. 12; ActewAGL, *Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period*, 2 June 2014, p. 261; Jemena Gas Networks, *2015-20 access arrangement information*, *appendix 9.03 Return on equity proposal*, 5 June 2014, p. 1.

877 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.

878 For instance, if there was an analyst forecast for APA on the 1st of April 2013 the DGM would determine the market value return on equity for that analyst forecast. SFG would subtract the risk free rate from the market value return on equity to determine the ERP for APA for the 1st April 2013. SFG would divide the ERP by the DGM's MRP estimate for the period 1 January 2013 to 30 June 2013 to determine the risk premium ratio. SFG would repeat this for all analyst forecasts for network businesses in its dataset.

879 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 20, p. 48.

4. Multiply the average risk premium by the prevailing MRP and add a prevailing risk free rate.

Service providers then used their empirical estimates of the return on equity to do one or more of the following:[880]

- To estimate their proposed return on equity as part of a multi model approach, or to inform input parameters into the SLCAPM).[881]
- To provide 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.[882]
- To provide evidence that the foundation model approach as set out in the Guideline will not contribute to the achievement of the allowed rate of return objective.[883]

Several service providers criticised our position in the Guideline and our draft decisions to limit the role of the DGM to informing the MRP. These service providers considered the DGM should inform the overall return on equity and not be limited to informing the MRP.[884] The majority of service providers used an estimate by SFG of an industry wide return to estimate the equity beta and MRP for the SLCAPM.[885]

In 2014, McKenzie and Partington reviewed the service providers' initial proposals and supporting documents. In 2015, Partington reviewed the revised proposals and

[880] For revised proposals, see Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p. 176; ActewAGL, *Revised regulatory proposal 2015–19*, January 2014, p. 468; Endeavour Energy, *Revised regulatory proposal*, January 2015, p. 213; Essential Energy, *Revised regulatory proposal*, January 2015, p. 216; TransGrid, *Revised revenue proposal*, January 2015, p . 113. Also see ActewAGL, *Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014*, pp. 262–276; Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p. 85; Endeavour Energy, *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, pp. 128–129; Energex, *2015–20 regulatory proposal*, October 2014, pp. 164–165; Ergon Energy, *Regulatory proposal appendix C: Rate of return*, October 2014, pp. pp. 128–129; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp. 114–115; JGN, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p. 2; SAPN, *Regulatory proposal 2015–20*, October 2014, p. 319;TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp. 188–191, pp. 12–13.

[881] ActewAGL, Energex, Ergon Energy, JGN, SAPN, TransGrid.

[882] ActewAGL, Ausgrid, Endeavour Energy, Essential Energy, JGN, TransGrid.

[883] ActewAGL, Ausgrid, Endeavour Energy, Essential Energy, Ergon Energy, JGN, TransGrid.

[884] For revised proposals, see Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p. 176; ActewAGL, *Revised regulatory proposal 2015–19*, January 2014, p. 468; Endeavour Energy, *Revised regulatory proposal*, January 2015, p. 213; Essential Energy, *Revised regulatory proposal*, January 2015, p. 216; TransGrid, *Revised revenue proposal*, January 2015, p . 113. Also see ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p. 258, 268; Ausgrid, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp. 79, 85; Endeavour Energy; Regulatory Proposal 1 July 2015 to 30 June 2019, 30 May 2014, pp. 119,128-129 ; Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp. 104,114-115; NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 50, 103; SFG, *Alternative versions of the dividend discount model and the implied cost of equity Report for Jemena Gas Networks, ActewAGL, APA, Networks NSW, Transend and TransGrid*, 15 May 2014, pp. 56–59.

[885] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014; CEG, *WACC estimates: A report for NSW DNSPs*, May 2014, pp. 7, 19–20.

associated material and maintained the positions in his 2014 report.[886] Having reviewed this material, McKenzie and Partington supported our decision to not use the DGM to directly estimate the return on equity on the benchmark efficient entity. They also supported limiting the use of the DGM to informing the estimate of the MRP.[887] However, they raised concerns around the reliability of DGM estimates.[888] While we use the DGM to inform the estimate of the MRP, we also take these concerns into account (see appendix C—MRP and appendix B—DGM).

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 DGM could generate virtually any return on equity estimate through model specification choices.[889]

- Having had regard to the material before us, we remain of the view that DGM estimates at the firm level are too unreliable to use to estimate the return on equity. No material submitted since the Guideline has changed our view. We consider our consultants' reports support this view.[890] In addition to the points above, we also note:
- SFG's approach does not entail directly estimating the return on equity for the benchmark efficient entity using the DGM. Rather, SFG applies its DGM to produce an MRP and a coefficient for energy networks' risk premiums relative to the MRP (an indirect equity beta estimate). We consider that, in doing so, SFG has overstated its DGM's ability to reliably estimate the return on equity for the benchmark efficient entity directly (see appendix B—DGM). SFG has responded to this point by defending its approach of producing an indirect estimate of beta.[891] Our point is not a criticism of SFG's indirect equity beta estimate per se — although we do not support it. Rather, our point is that SFG is effectively using its DGM to estimate the MRP to incorporate into a SLCAPM. Meanwhile, SFG criticised our approach of using the DGM to estimate the MRP, rather than to directly estimate the benchmark efficient entity's required return on equity.
- There are less analyst forecast-based estimates of the return on equity for network business than for all firms in the market.[892] Therefore, we expect DGM estimates would be more reliable at the market level than the industry specific level (noting

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886 Partington, *Report to the AER: Return on equity (updated), April 2015*, p. 12.

887 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, p. 39.

888 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 26–36.

889 McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 34–36.

890 Handley, *Advice on return on equity,* 16 October 2014, pp. 13–15; McKenzie and Partington, *Report to the AER part A: Return on equity*, October 2014, pp. 26–41.

891 SFG, *Share prices, the DDM and the cost of equity for the market and a benchmark energy network*, February 2015, p. 31 (para 173 point a). Also see SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, pp. 15–16.

892 There are only 99 analyst forecast-based estimates of the return on equity for network business between 1 June 2002 and 20 February 2014. Whereas, there are 5,344 analyst forecast-based estimates of the return on equity for all firms in the market. SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, pp. 49–50.

we do not consider them particularly reliable at the market level). SFG has responded to this point by stating, 'we cannot compare the usefulness of one estimation technique to another just by counting data points'.[893] We do not find this response satisfying, particularly given SFG has not submitted convincing reasons for its approach to estimating an indirect equity beta.

- The very high return on equity estimates from SFG's DGM model, equating to an equity beta of 0.94 in the SLCAPM, appear inconsistent with the results in Professor Olan Henry's 2014 report.[894] These also appear inconsistent with the low risk nature of regulated natural monopolies with very low elasticity of demand for their services.[895] SFG appears to have responded to this point by criticising our conceptual analysis and our reliance on OLS to estimate the equity beta.[896] We remain satisfied with our position. The large volume of material we considered in appendix D—equity beta indicates that 0.94 is well above the range of reasonable estimates of the equity beta. SFG appears to criticise us by stating, 'the AER has only ever relied upon one measure of the risk of a benchmark energy network – the slope coefficient from a regression of stock returns on market returns'.[897] However, under the SLCAPM, the relevant risk of an individual stock is its contribution to the risk of a well-diversified portfolio — that is, market risk. This relevant risk is captured by the equity beta, which is the correlation between the stocks return with the return on the market.[898]

In a short note for several service providers, Grant Samuel considered we did not give balanced regard to these two sources of information.[899] We consider this preliminary decision has appropriate regard to the relative strengths and limitations of the SLCAPM and the DGM. Given this, we highlight the following:

- This section of appendix A focuses on why we do not use DGMs to directly estimate the return on equity for the benchmark efficient entity. Therefore, it is more geared towards the limitations of DGMs. To understand how we use DGMs, this appendix should be read in conjunction with appendix B—DGM and our material on the MRP.

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[893] SFG, *Share prices, the DDM and the cost of equity for the market and a benchmark energy network*, February 2015, p. 31 (para 173 point b). Also see SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, pp. 15–16.

[894] Henry found the majority of equity beta estimates for energy network service providers operating in Australia fell between 0.3 and 0.8. See Henry, *Estimating beta: an update*, April 2014, p. 63.

[895] See Frontier Economics, *Assessing risk for regulated energy networks*, July 2013; McKenzie and Partington, *Estimation of equity beta*, April 2012, p. 6.

[896] SFG, *Share prices, the DDM and the cost of equity for the market and a benchmark energy network*, February 2015, p. 32; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, pp. 15–16.

[897] SFG, *Share prices, the DDM and the cost of equity for the market and a benchmark energy network*, February 2015, p. 32.

[898] Brigham, Daves, 'Intermediate financial management', 2010, Ed. 10, South-Western Cengage Learning, pp. 48–49.

[899] Grant Samuel & Associates, *AER — Draft decision*, 12 January 2015, p. 2. ActewAGL, JGN and TransGrid submitted this response.

- While we acknowledge DGMs' limitations, we also acknowledge their strengths. For example, see 3.4.1 of attachment three, appendix C—MRP and appendix B—DGM. Appendix B focuses on explaining how and why we construct and apply the DGM to inform our decision. In this appendix, we ask the question, 'given we are applying a DGM, how can we apply it well and what do we need to be careful of?' We also discuss limitations regarding the DGM's sensitivities in appendix B. However, we consider it helpful to have regard to these limitations in forming our decision. Similarly, Grant Samuel also acknowledged that DGMs have limitations in stating:[900]

> We accept the question of the long term dividend growth rate becomes the central issue and is subject to a much higher level of uncertainty (including potential bias from sources such as analysts) and we do not dispute the comments by Handley on page 3-61

We are satisfied with our decision to use the DGM to inform our MRP estimate rather than the overall return on equity estimate. We consider this is based on sound reasoning, as set out in appendix B—DGM. Further, we consider it is evident in this preliminary decision that using the DGM at the MRP level had a real impact on our estimated return on equity, through influencing our decision to select a higher estimate of the MRP.

Overall conclusions with respect to the DGM

For the reasons discussed above, we do not consider estimates of the benchmark efficient entity's return on equity from DGMs suitable for our regulatory task. This includes:

- Estimating the return on equity for the benchmark efficient entity.
- Estimating a return on equity to assess the reasonableness of other return on equity estimates (including the return on equity estimate from our implementation of the SLCAPM).

We remain of the view that it is appropriate to use our construction of the DGM to inform the MRP. This is for the reasons discussed in section 3.4.1 of attachment three and appendix B—DGM. However, we note McKenzie and Partington's concerns around our DGM's outputs and have taken these concerns into account when using MRP estimates based on DGMs.

See appendix C—MRP and appendix B—DGM for further discussion on the use of the DGM for estimating the return on equity and around the application of the DGM to estimate the MRP. We provide an assessment of DGMs against our assessment criteria in section 3.4.1. We also assess SFG's and our DGM against our assessment criteria in appendix B—DGM.

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900 Grant Samuel & Associates, *AER — Draft decision*, 12 January 2015, p. 3.

A.3.5 Other model-based estimates of the return on equity

Service providers have put forward a number of other estimates of the return on equity to support their proposals.[901] While we also discuss these in section 3.4.1, we consider CEG's and NERA's specific applications of these models below.

We have had regard to and considered the empirical estimates based on these alternative specifications of the SLCAPM. However, we do not use empirical estimates of the return on equity from the 'long term' (historically based) specification of the SLCAPM. We do not consider these estimates will result in an estimate of the return on equity that will contribute to the achievement of the allowed rate of return objective. The Wright approach does not have a large role in informing our return on equity estimate. We do not consider that giving this information a large role would contribute to the achievement of the allowed rate of return objective.[902]

We consider NERA's 'prevailing' specification of the SLCAPM substantively the same as our specification, with the exception of using different input parameters.[903] Therefore, we do not discuss NERA's model here.

NERA long term average specification of the SLCAPM

In its report for TransGrid's initial revenue proposal, NERA estimated a 'long term average' specification of the SLCAPM. TransGrid's revised revenue proposal referenced NERA's report and confirmed, 'TransGrid maintains this position and does not propose to put forward further argument'.[904] This gave an estimated return on equity of 8.9 per cent.[905] It used historically based estimates of both the risk free rate and MRP, combined with its equity beta estimate of 0.58.[906] NERA calculated each input parameter as follows:

- It based its risk free rate on the average on 10 year Commonwealth Government Security (CGS) yield over the last 10 years to 31 March 2014 (5.11 per cent).
- It calculated its MRP of 6.5 per cent as the average excess return on the market portfolio over 1883 to 2012.[907]
- It based its equity beta of 0.58 on an estimate by SFG using a group of nine Australian firms.[908]

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901 We note that NERA does not submit that any of its estimates from the different SLCPAM specifications reflect the benchmark entity's required return on equity.

902 The Wright specification of the SLCAPM (Wright CAPM) assumes the real expected return on the market is constant. We use the Wright CAPM to estimate a range (at a point in time). See AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 26–28.

903 This specification was outlined in NERA's report submitted with TransGrid's initial revenue proposal. See NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014.

904 TransGrid, *Revised revenue proposal*, January 2015, p. 115.

905 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 45.

906 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 80.

907 Based on NERA, *The MRP: Analysis in response to the AER's draft rate of return guidelines*, October 2013, p. iii.

We consider NERA's long term average specification does not and would not be expected to result in a return on equity that would contribute to the achievement of the allowed rate of return objective. We do not agree with the form of the model (a historically based SLCAPM). The SLCAPM is a forward looking asset pricing model.[909] 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.[910]

With respect to each input parameter NERA used, we note the following:

- The risk free rate estimate of 5.11 per cent is far above the current forward looking risk free rate estimated using 10 year CGS yields. This results in an overestimate of the required return on equity. We also consider this would result in a return on equity that has not had regard to prevailing conditions in the market for equity funds.[911]
- We consider an MRP of 6.5 per cent a reasonable estimate of the forward looking MRP. For a discussion on the MRP, see section 3.4.1 and appendix C—MRP.
- We consider an equity beta estimate of 0.7 is more appropriate for the reasons discussed in section 3.4.1 and appendix D—Equity beta.

For our assessment of historical CAPM specifications against the assessment criteria, see section 3.4.1.

CEG long term average specification of the SLCAPM

CEG estimated a long term specification of the SLCAPM for the NSW distributors' initial and revised regulatory proposals. For the initial proposals, this gave an estimated return on equity of 10.1 per cent.[912] For the revised proposals, this gave an estimated return on equity of 10.15 per cent.[913] As with NERA's specification, it used historically based estimates of both the risk free rate and MRP, combined with its equity beta estimate. CEG estimated a historically based risk free rate over 1883 to 2011 in its

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908 NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014, p. 79. SFG produces this estimate using a group of nine comparable Australian firms. See SFG, *Regression-based estimates of risk parameters for the benchmark firm*, 24 June 2013, p. 16.

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

910 McKenzie and Partington advised 'the current marker 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.

911 The rules require that in estimating the return on equity, regard must be had to the prevailing conditions in the market for equity funds. See NER 6.5.2(g); 6A.6.2(g); NGR 87(7).

912 CEG, *WACC estimates: A report for NSW DNSPs*, May 2014.

913 CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 6.

initial report, and updated this to 2013 in its second report. In its second report, CEG calculated each input parameter as follows:

- It based the risk free rate on the average 10 year CGS yield over the period 1883 to 2013 (4.77 per cent).
- It calculated the MRP as the average excess return on the market portfolio over the period 1883 to 2013 (6.56 per cent).
- It based its equity beta estimate of 0.82 on regression-based beta estimates, using both Australian and US firms.

As with NERA's long term average specification of the SLCAPM, we do not agree with the form of the model.[914] We consider CEG's long term average specification does not and would not be expected to result in a return on equity that will contribute to the achievement of the allowed rate of return objective.

With respect to each input parameter, we note the following:

- The risk free rate estimate of 4.77 per cent is far above the current forward looking risk free rate estimated using 10 year CGS yields. This results in an overestimate of the required return on equity. We also consider this would result in a return on equity that has not had regard to prevailing conditions in the market for equity funds.[915]
- We consider the MRP of 6.5 per cent a reasonable estimate of the forward looking MRP. This is for the reasons discussed in section 3.4.1 and appendix C—MRP.
- We consider an equity beta estimate of 0.7 more appropriate for the reasons discussed in section 3.4.1 and appendix D—Equity beta.

See section 3.4.1 for our assessment of historical CAPM specifications against the assessment criteria.

NERA's Wright specification of the SLCAPM

For TransGrid's initial revenue proposal, NERA estimated a 'Wright' specification of the SLCAPM (Wright CAPM) that resulted in an estimated return on equity of 8.47 per cent.[916] TransGrid's revised revenue proposal referenced NERA's report and confirmed, 'TransGrid maintains this position and does not propose to put forward further argument'.[917] NERA used the prevailing risk free rate (4.14 per cent) and an equity beta of 0.58. However, the Wright CAPM assumes the return on the market is relatively constant through time. It therefore assumes a clear inverse relationship

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914 That is, this is a historically based CAPM, whereas the SLCAPM is a forward looking asset pricing model. Bringham and Daves, *Intermediate financial management*, Ed. 10, Cengage Learning, 2010, p. 53.

915 The rules require that in estimating the return on equity, regard must be had to the prevailing conditions in the market for equity funds. See NER 6.5.2(g); 6A.6.2(g); NGR 87(7).

916 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 81.

917 TransGrid, *Revised revenue proposal*, January 2015, p. 115.

between movements in the risk free rate and MRP. NERA calculated each input parameter as follows:

- It estimated the risk free rate as 4.14 per cent, based on 10 year CGS yields over the 20 business days to 31 March 2014.[918]
- It based its equity beta of 0.58 on an estimate by SFG using a group of nine Australian firms.[919]
- It calculated the MRP as 7.46 per cent. This was based on an estimated real return on the market of 8.87 per cent and an inflation rate of 2.5 per cent. This gave a nominal return on the market of 11.6 per cent and an MRP of 7.46 per cent.[920]

We do not agree with the form of the Wright CAPM, or the underlying premise of the model that there is a clear inverse relationship between movements in the risk free rate and MRP. We note the model is not widely accepted or used in practice.[921] We consider capital (equity and debt) commands a risk premium over a base (risk free) rate and it is unclear why this risk premium would increase or decrease to entirely offset changes in the base risk free rate. 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 MRP.[922] Further, we do not consider the model adequately takes into account the prevailing conditions in the market for equity funds to the extent that movements in the MRP do not perfectly offset movements in the risk free rate.[923]

We also note the following considerations with respect to NERA's application of the model:

- We agree with the proxy used to measure the risk free rate (an average of relatively current 10 year CGS yields).
- We consider the MRP estimate of 7.46 per cent too high for the reasons discussed in section 3.4.1 and appendix C—MRP.
- We consider an equity beta of 0.7 more appropriate for the reasons discussed in section 3.4.1 and the appendix D—Equity beta.

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918 We note this would be updated in any actual application.

919 NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014, p. 79. SFG produces this estimate using a group of nine comparable Australian firms. See SFG, *Regression-based estimates of risk parameters for the benchmark firm*, 24 June 2013, p. 16.

920 11.6% – 4.14% = 7.46%.

921 The model'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.

922 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.

923 The rules require that in estimating the return on equity, regard must be had to the prevailing conditions in the market for equity funds. See NER 6.5.2(g); 6A.6.2(g); NGR 87(7).

In general, we are not satisfied that relying greatly on estimates under the Wright approach would contribute to the achievement of the allowed rate of return objective.

CEG's Wright specification of the SLCAPM

CEG estimated a Wright CAPM for the NSW distributors' initial and revised regulatory proposals. For the initial proposals, this estimated a return on equity of 10.2 per cent, using a prevailing risk free rate (3.96 per cent) and CEG's estimate of the equity beta (0.82)[924] For the revised proposals, this gave an estimated return on equity of 10.10 per cent using a prevailing risk free rate (3.07 per cent) and CEG's estimate of the equity beta (0.82).[925] In its report for the revised proposals, CEG calculated each input parameter as follows:

- It estimated the risk free rate as 3.07 per cent, based on 10 year CGS yields averaged over 20 days ending 19 December 2014.[926]
- It based its equity beta estimate of 0.82 on regression-based beta estimates, using both Australian and US firms.[927]
- It calculated the MRP as 8.57 per cent. It based this on an estimated real return on the market of 8.92 per cent and an inflation rate of 2.5 per cent. This gave a nominal return on the market of 11.64 per cent and an MRP of 8.57 per cent.[928]

We do not consider CEG's Wright CAPM does or would be expected to result in a return on equity that would contribute to the achievement of the allowed rate of return objective. Also, we are satisfied that the Wright approach could only have limited value in informing a return on equity that contributes to the achievement of the allowed rate of return objective. We do not consider the Wright CAPM is theoretically or empirically robust for the reasons discussed with respect to NERA's Wright SLCAPM specification.

We note the following with respect to CEG's application of the model:

- We agree with the proxy used to measure the risk free rate (an average of relatively current 10 year CGS yields).
- We consider the MRP estimate of 8.57 per cent too high for the reasons discussed in section 3.4.1 and appendix C—MRP.
- We consider CEG's equity beta estimate of 0.82 too high for the reasons discussed in section 3.4.1 and the appendix D—Equity beta.

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924 CEG, *WACC estimates: A report for NSW DNSPs*, May 2014, p. 30.

925 CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 5.

926 CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 5. We would update this in any actual application.

927 CEG, *WACC estimates: A report for NSW DNSPs*, May 2014, pp. 6–10; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 5.

928 11.64%–3.07% =8.57%.

For these reasons, we consider CEG's return on equity estimate using the Wright CAPM will not contribute to the achievement of the allowed rate of return objective. See section 3.4.1 for our assessment of the Wright CAPM against the assessment criteria.

Overall conclusions on long term and Wright specifications of the SLCAPM

For the reasons discussed above, we do not consider empirical estimates from 'long term' or Wright specifications of the SLCAPM (that is, historically based versions of the SLCAPM) are currently suitable for our regulatory task. This includes:

- estimating the return on equity for the benchmark efficient entity
- estimating a return on equity for the purpose of assessing the reasonableness of other return on equity estimates (including the return on equity estimate from our implementation of the SLCAPM).

We have had regard to empirical estimates of the return on equity from long term (historical) and Wright specifications of the SLCAPM put forward by the service providers and their consultants. However, we do not use empirical estimates of the return on equity from the 'long term' (historically based) specification of the SLCAPM. We do not consider these estimates will result in an estimate of the return on equity that will contribute to meeting the allowed rate of return objective. The Wright approach does not have a large role in informing the allowed return on equity.[929] We do not consider that giving this information a large role would contribute to the achievement of the allowed rate of return objective. For our use of the Wright approach, see step four of our foundation model approach under section 3.4.1.

[929] The Wright specification assumes the real expected return on the market is constant. We use the Wright approach to estimate a range (at a point in time). See AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 26–28.

B Dividend growth model

Dividend growth models (DGMs) use forecast dividends of businesses 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.[930] Consistent with the rate of return guideline (Guideline), we use DGMs only to inform our estimate of the market risk premium (MRP).[931]

There are many ways to construct a DGM. We consider our construction of the DGM has some value in informing the MRP. However, the practical implementation of DGMs has significant limitations which we consider limits their usefulness. We use our preferred construction of the DGM, which we consider balances simplicity and transparency with the ability to generate results that are estimated consistently over time,[932] given the limitations of implementing the model. Moreover, we consider DGMs as a class are likely to overstate the return on equity and/or the MRP. This is because:

- analyst forecasts are well understood to be upward biased[933]
- DGMs use dividends as a proxy for free cash flow to equity (see section B.5.1).

In this appendix we set out our preferred construction of the DGM and assess the more complex DGM SFG Consulting (SFG) proposed in various reports for several service providers.[934] At the present time, SFG's DGM and our preferred construction of the DGM produce similar estimates of the MRP. This appears to be a coincidence—rather than a commonality in approach and/or agreement in DGM construction. DGMs are highly sensitive to the data, model specification, computations and assumptions employed. This appendix explains our concerns with the limitations of DGMs in general, and SFG's DGM in particular.

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930 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.

931 AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 84.

932 In the Guideline we stated that ' For DGMs to be given greater consideration in the regulatory process, we consider that it is necessary to settle on a variant that can be consistently applied through time. A consistent approach through time will moderate some of the causes of variation.'. See: AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 85.

933 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.

934 SFG, *Alternative versions of the dividend discount model and the implied cost of equity: Report for Jemena Gas Networks, ActewAGL, APA, Ergon, Networks NSW, TasNetworks and TransGrid*, 15 May 2014 (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: Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL Electricity, APA, Ausgrid, AusNet Services, CitiPower, Endeavour, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, 13 February 2015 (SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015).

In this appendix we set out:

- Our preferred construction of the DGM.
- The reasons for our preferred construction of the DGM. This includes our reasons for not adopting the DGM SFG proposed in its reports for several service providers. This also includes an assessment of SFG's and our DGMs against the criteria set out in the Guideline.
- Our reasons for using DGMs to inform the MRP. We also provide reasons for not using DGMs to inform the overall return on equity for a benchmark efficient entity.
- Prevailing estimates of the MRP using our preferred construction of the DGM.
- Discussion of potential bias in our, and other, DGM estimates and some sensitivity analysis surrounding our prevailing estimates.

B.1 Preferred construction of the dividend growth model

Our preferred construction of the DGM is consistent with that set out in the Guideline.[935] The following equation depicts this DGM, which we apply to estimate *k*, the expected return on equity for the market portfolio:

$$P_c = \frac{m \times E(D_c)}{(1+k)^{m/2}} + \sum_{t=1}^{N} \frac{E(D_t)}{(1+k)^{m+t-0.5}} + \frac{\frac{E(D_N)(1+g)}{k-g}}{(1+k)^{m+N-0.5}}$$

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[936]

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 DGM:

- A two stage DGM, which assumes that dividends grow at the long term growth rate following the dividend forecast period.

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935 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.

936 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.

- A three stage DGM, 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 DGMs also display the following characteristics:

- They use analysts' consensus forecasts for the overall market from the Bloomberg Professional Services (Bloomberg).
- They estimate the market return on equity monthly based on consensus dividend forecasts for the current and following two financial years.
- They estimate a long term growth rate in dividends per share (DPS). We determine this by adjusting the long term growth rate in gross domestic product (GDP) for the net creation of shares.

B.2 Reasons for the preferred construction

There are various high level reasons why we consider our preferred construction of the DGM is reasonable. For instance, we developed our preferred construction of the DGM in close consultation with stakeholders when developing the Guideline.[937] We have considered a variety of submissions on our construction of the DGM,[938] which have not persuaded us to depart.[939] Further, experts have critically reviewed our construction of the DGM.[940] We consider this advice suggests that, overall, our construction of the DGM is reasonable.[941] We also have sound reasons for adopting the technical specifications of our preferred construction of the DGM. We discuss these reasons in the following paragraphs.

B.2.1 The long term dividend growth rate

We consider our estimated long term growth rate of nominal DPS[942] of 4.6 per cent to be reasonable, if not 'somewhat on the generous side'.[943] We derive this by:

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937 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.

938 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.

939 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.

940 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.

941 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.

942 Hereafter, we use long term dividend growth rate and long term growth rate of nominal dividends per share interchangeably.

943 McKenzie and Partington, *The DGM*, December 2013, p. 15. McKenzie and Partington find the average of the long term dividend growth rate estimates they consider is 3.73% (3.78% excluding the most extreme values).

- Starting with Lally's estimated long term expected growth rate in real GDP of 3.0 per cent. This recognises that it is implausible for dividends to grow faster than the economy in the long term (that is, in perpetuity). Otherwise, the stock market would outgrow the overall economy, which does not make sense.[944] When producing this estimate, Lally had regard to the following:[945]

  > In respect of the long-run expected GDP growth rate, the historical average over the period 1900-2000 is 3.3% (Bernstein and Arnott, 2003, Table 1), and the average over the 11 years since 2000 is 3.1% (The Treasury, 2012, Chart 2.2), yielding an average over the period 1900-2011 of 3.3%. Furthermore, Bernstein and Arnott provide average real GDP growth rates over 16 developed countries, and the average over this set of 16 countries is 2.8%, suggesting that even the figure of 3.3% is too high. Furthermore, the Australian Federal Treasury (The Treasury, 2012, Chart 2.2) has forecasted the Australian real GDP growth rate at 3% over the next four years. Taking account of all of this, an estimate for long-run expected real GDP for Australia should be about 3%.

- Applying deductions of 0.5, 1.0 and 1.5 per cent to the long term expected growth rate of real GDP to obtain the expected long term growth in real DPS. We apply these deductions because the expected long term growth in real GDP is higher than the expected long term growth in real DPS. This is because of the net creation of shares through new share issuance (net of buybacks) and the emergence of new companies.[946] In determining what deductions to apply, Lally considered the following:[947]
  - Bernstein and Arnott argued for subtracting 2.0 per cent. This is partly because real GDP growth over the last century grew about 2.0 per cent faster than real growth in DPS with per annum.[948] However, Lally considered this comparison would exaggerate the relevant adjustment in the presence of a declining dividend payout rate.[949]
  - Bernstein and Arnott argued to subtract 2.0 per cent. This is partly because market capitalisation grew about 2.0 per cent per annum faster than a capitalisation-weighted price index, using US data since 1925. However, Lally considered this comparison would exaggerate the relevant adjustment when market capitalisation grows simply due to listings from foreign firms and from previously unlisted US firms.

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944 Lally, *The dividend growth model*, 4 March 2013, p. 13.

945 Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, p. 14.

946 Bernstein, Arnott, 'Earnings Growth: The Two Percent Dilution', *Financial Analysts Journal*, September/October 2003.

947 Lally, *The dividend growth model*, 4 March 2013, p. 14.

948 Bernstein, Arnott, 'Earnings Growth: The Two Percent Dilution', *Financial Analysts Journal*, September/October 2003, table 1.

949 A declining dividend payout rate has been characterised in at least the US market. See Grinold, Kroner and Siegel, 'A Supply Model of the Equity Premium', *The Research Foundation of CFA Institute*, 2011, No. 4, Figure 1.

- Given the points above, Lally considered the correct adjustment is less than 2.0 per cent.

- Nominalising growth, by assuming expected inflation is 2.5 per cent, given by the midpoint of the Reserve Bank of Australia's (RBA's) target range of 2.0 to 3.0 per cent.

McKenzie and Partington advised that if anything, the long term dividend growth rate we apply is somewhat on the generous side.[950] They considered the average of long term dividend growth rate estimates should be 3.73 per cent—or 3.78 per cent, excluding the most extreme values.[951] In contrast, we apply an estimate of 4.6 per cent.

In its 2014 and 2015 reports for several service providers, SFG disagreed with McKenzie and Partington's view that our long term dividend growth rate may be generous.[952] It considered there was a transposition error in the table of nominal long term dividend growth rate estimates McKenzie and Partington used to generate their recommended growth rate (that is, it considered they are actually meant to be real growth rates). SFG formed this view on the basis that it was unlikely to be the case that some of the nominal growth rate estimates would be as low as 0.13 to 1.54 per cent. McKenzie and Partington responded to this in their 2014 report, stating that the growth rates they use are nominal and should not be adjusted for inflation.[953] Partington reiterated this view in his 2015 report.[954]

In its 2014 report for several service providers, SFG questioned our view that the long term dividend growth rate could not exceed long term growth in GDP.[955] We consider our view is reasonable for the following reasons:

- In the long term, aggregate dividends cannot grow at a rate greater than growth in the overall economy. Such an outcome would result in the stock market being larger than the overall economy in the long term. Such an outcome is not plausible as the stock market is a component of the overall economy. McKenzie and Partington supported this.[956]

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[950] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 53; McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 34; McKenzie and Partington, *The DGM*, December 2013, p. 24.

[951] 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.

[952] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, pp. 42–43; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 13.

[953] McKenzie and Partington, *Report to the AER: Part A, return on equity*, October 2014, pp. 33–34

[954] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 53.

[955] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 3.

[956] McKenzie, Partington, *Report to the AER: The Dividend Growth Model (DGM)*, 14 December 2013, p. 13.

- We accept that the above point is a long term argument.[957] However, in SFG's and our DGMs, the long term dividend growth rate applies to the longest period available, which extends to infinity. If we were to accept SFG's proposition that the market will not revert to the long term growth rate for an extended period of time, we should account for this by modifying the length of the transition period rather than the long term growth rate.
- SFG noted our estimate of the market value return on equity is higher under our three stage DGM than under our two stage DGM.[958] SFG submitted this is because listed firms empirically exhibit dividends and earnings growth above our long term growth estimate.[959] We do not agree that this difference necessarily reflects that our long term dividend growth rate is too low. For instance, this difference could arise because analysts' forecasts are upwardly biased. This upwards bias is widely accepted among researchers.[960] McKenzie and Partington also noted this difference:[961]

> also accords with the tendency we noted in McKenzie and Partington (2013b*), for the almost invariably optimistic assumption that whatever the current period happens to be, it is a period of dividend growth rates above the long run rate. While this is feasible for some periods, it is not possible for all periods.

In its 2015 report, SFG disagreed with our view that the long term dividend growth rate could not exceed long term growth in GDP once more.[962] We do not agree with SFG. We consider it is reasonable to adopt a long term dividend growth rate that is lower than the expected long term growth in GDP for the reasons outlined above. Further:

- McKenzie and Partington noted that there are various assumptions one can make to derive an estimate of the long term dividend growth rate.[963] For example, at times, the long term dividend growth rate has been set to the inflation rate, the interest rate, the GDP growth rate and the growth in GDP less a reduction to allow for future capital raisings. We consider our approach to estimating the long term dividend growth rate (detailed above) is reasonable. We do not base our estimate of the long term dividend growth rate on historical market returns.[964]

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957 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 33.

958 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'. However, SFG calls the book value return on equity, the 'return on equity'.

959 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 6.

960 See: Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 46; McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 26; McKenzie and Partington, *The DGM*, December 2013, pp. 8–9.

961 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 33; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 52.

962 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 9–16.

963 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 48; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 47.

964 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 9–11.

- The long term dividend growth rate is a very long term concept. For example, both our three stage DGM and SFG's DGM assume that DPS grow at the long term growth rate from year 10 to infinity. In this framework, we consider it is implausible for the long term dividend growth rate to be higher than the expected long term GDP growth rate. However, SFG submitted that:
    - In Australia, earnings per share (EPS) grew faster than GDP in the recent period from 1990 to 2013, where there has been low inflation and high price–earnings ratios (P/E). It submitted that this is the relevant period for estimating the long term dividend growth rate.[965]
    - If earnings grow at a higher rate than GDP, then mathematically, earnings would eventually exceed GDP. However, the most important period is the next 100 years or less. SFG submitted that the EPS of a large listed company could keep pace with GDP growth for 100 years because it is possible to observe listed companies exhibiting such EPS growth for decades. It also submitted that this is consistent with the recent decades of low inflation high P/E.[966]
- We are not satisfied that observations of listed company earnings over a few recent decades implies that DPS (or EPS) across the market will keep pace with GDP growth in the long term (which extends to infinity in the DGM), or even 100 years, as SFG has suggested. In any given period, dividends can grow at rate higher or lower than the GDP growth rate. Negative growth is also possible.[967] However, in the long term (that is, in steady state equilibrium), we do not consider such growth is sustainable. We consider Lally has regard to the long term nature of the dividend growth rate by estimating the long term expected real GDP growth rate with reference to the historical average from 1900 to 2011, as well as short term forecasts.[968] In contrast, SFG based its views on GDP and earnings growth on relatively short time periods (for example, 1990 to 2013). If we were to use current information to estimate the long term dividend growth rate, we would note that GDP (in Australia) has grown at around 2.5 per cent on average in the past two years,[969] and the RBA, in its most recent Monetary Policy decision, stated:[970]

965 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 6, 12–13.

966 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 6–7, 15–16.

967 For example, McKenzie and Partington stated that 'Negative growth rates are more than a remote theoretical possibility. In a study of UK water utilities, Armitage (2012) finds that the utilities have been financing dividends and incurring debt, with the consequence that dividend cuts will be inevitable.'. See: McKenzie and Partington, pp. 28–29; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 48.

968 Lally then applied deductions to this estimate to account for the net creation of shares and the emergence of new companies, which implies expected long term DPS growth is less than expected long term GDP growth. See: Bernstein, Arnott, 'Earnings Growth: The Two Percent Dilution', *Financial Analysts Journal*, September/October 2003.

969 RBA, *Statement on Monetary Policy*, February 2015, p. 37.

970 RBA, *Statement by Glenn Stevens, Governor: Monetary Policy Decision*, 7 April 2015.

In Australia the available information suggests that growth is continuing at a below-trend pace, with overall domestic demand growth quite weak as business capital expenditure falls.

- If SFG considers earnings can grow at a rate higher than GDP for an extended period of time, but will eventually revert to the long term GDP growth rate, then it should adjust the length of its transition period rather than the long term growth rate.
- SFG again submitted our estimate of the market value return on equity is higher under our three stage DGM than under our two stage DGM because dividend growth over the first two forecast years is above our long term growth estimate. We maintain our above consideration that this difference does not necessarily reflect that our long term dividend growth rate is too low (see above for our reasoning).
- SFG also submitted that the expected long term GDP growth rate and dividend growth rate are estimates, not facts.[971] We agree, but consider these growth rates must be estimated because they are not observable. We consider Lally has derived a reasonable estimate of the expected long term GDP growth rate. He used this to transparently derive a reasonable estimate of the long term dividend growth rate, based on the view that expected long term growth in real GDP is higher than the expected long term growth in real DPS.[972] We note that SFG have not provided an alternative expected long term GDP growth rate estimate.

B.2.2 Standard dividend growth models versus endogenous growth models

It is common practice to estimate the long term dividend growth rate for the market outside of the DGM (standard DGMs).[973] SFG submitted an alternative approach, which entails estimating the long term dividend growth rate within the DGM itself. We recognise there is no consensus on what is the most appropriate form of DGM.[974]

However, we consider our two stage and three stage DGMs, which are standard DGMs, are preferable to SFG's proposed DGM (which is a form of endogenous growth model) for the following reasons:

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971 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 6.

972 This is because of the net creation of shares through new share issuance (net of buybacks) and the emergence of new companies. See: Bernstein, Arnott, 'Earnings Growth: The Two Percent Dilution', *Financial Analysts Journal*, September/October 2003.

973 For example, Gordon and Gordon (1997); Claus and Thomas (2001); Gebhardt et al. (2001); Gode and Mohanram (2003); Fama and French (2002); Chen et al. (2004) and; Botosan and Plumlee (2005).

974 This is discussed in Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., pp. 560–639. This shows there are papers which support the standard version of the DGM: Gordon and Gordon (1997); Claus and Thomas (2001); Gebhardt et al. (2001); Gode and Mohanram (2003); Fama and French (2002); Chen et al. (2004) and; Botosan and Plumlee (2005). There are also papers that support jointly estimating the cost of equity and long terms growth rate endogenously: Easton (2004); Easton et al. (2002) and; Nekrasov and Ogneva (2011).

- Standard DGMs are more widely used in practice to determine the return on equity. For instance in the United States, rate case regulators have used the standard DGM when estimating the return on equity.[975] Further, many previous consultant reports from service providers have submitted that we should use a standard DGM.[976] Since standard DGMs are more widely used, there is a better understanding of their limitations. Handley considered SFG's DGM and advised that it is a new model whose widespread use and acceptance has not been established.[977]
- Standard DGMs are significantly less complicated than endogenous growth models. We consider there are significant costs associated with complexity. For instance:
  - More complex models are harder to replicate. As a result, these models are relatively opaque to stakeholders. McKenzie and Partington considered that due to the complexity of SFG's DGM, they doubted they could replicate SFG's results given the same dataset.[978]
  - Complex models are more difficult to administer. For instance, our DGM is relatively mechanical to implement. We download the data from Bloomberg and apply it to a formula. On the other hand, SFG's DGM is considerably more complex to implement and requires substantially more computations to calculate the market value return on equity.[979] For instance, estimating the MRP over 10.5 years using SFG's model appears to require more than 128 million individual computations.[980]
  - More complex models may make it harder for stakeholders to participate in the regulatory process. For instance, if we use a particularly complex DGM, stakeholders may not know the inner workings of the model. What drives the results could also become less clear to stakeholders. This may result in stakeholders being less able to contribute in the consultation process. We note, the NER places an emphasis on service providers engaging with their customers.[981]

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975 Since the 1980s, the US Federal Energy Regulatory Commission (FERC) has used DGMs to estimate the return on equity. See FERC, *Policy statement: Composition of proxy groups for determining gas and oil pipeline return on equity*, 17 April 2008, pp. 2–3.

976 CEG, *Internal consistency of the risk free rate and MRP in the CAPM*, 30 March 2012, p. 50; NERA, P*revailing conditions and the market risk premium: A report for APA Group, Envestra, & AusNet*, March 2012, pp. 32, 38; Lally, *The dividend growth model, Victoria University of Wellington*, 4 March 2013, pp. 13–15; Lally, *The cost of capital under imputation, prepared for th*e ACCC, 2002, pp. 29–34.

977 Handley, *Advice on the return on equity*, 16 October 2014, p. 15.

978 McKenzie and Partington, *Report to the AER: The DGM*, 14 December 2013, p. 21.

979 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'.

980 SFG considers 47,908 forecasts and 2,672 combinations. Multiplied this is 128,010,176. Under this approach, one would also average over 6 months per firm and average across the firms to get return on market. This approach also requires additional calculations to compute the most 'optimal' combination of factors.

981 NER, cl. 6.8.2(c1)(2), 6A.10.1(g)(2). Similarly, 16(1)(b) of the NEL and 28(1)(b) of the NGL requires we inform stakeholders of material issues under consideration and give them a reasonable opportunity to make submissions.

- In the Guideline, we noted that less complex approaches can be preferred as stakeholders are more likely to understand them. Also, they are less prone to data mining and inappropriate correlation within the model.[982]

We recognise more complicated models may sometimes be preferable. For example, this could occur if the increased complexity produced a more accurate estimate of the return on equity. However, we do not consider the increased complexity of SFG's DGM has been justified.[983] This is consistent with our consultant's views. McKenzie and Partington advised that while SFG's DGM is interesting, it is unclear that it achieves any real improvement in the accuracy of the return on equity estimate.[984] Specifically, McKenzie and Partington were unconvinced about the merits of SFG's DGM, and described it as 'an additional choice among many'. They considered that a reasonable requirement, before adopting SFG's DGM over well established models, would be agreement on its credibility in the research literature and/or widespread use in practice.[985] SFG's DGM does not satisfy either of these requirements.

In its 2015 report, SFG questioned our view that its endogenous DGM construction is more complex than standard DGMs, and that the increased complexity has not been justified.[986] SFG submitted that performing many computations is not the same as performing complex computations. It also submitted that its analysis of more detailed information leads to more reliable DGM estimates. We disagree. We maintain our consideration that SFG's DGM (an endogenous growth model) is significantly more complicated than our (standard) DGMs, and that this increased complexity has not been justified. We detail our reasoning above.

Further, we consider some consultants have overstated the merits of endogenous growth models, by presenting them to be more scientific and less assumption-based than they are in practice.[987] McKenzie and Partington showed that under the endogenous growth model, for a given price/earnings ratio, one can obtain any return on equity estimate by judiciously choosing the reinvestment rate and return on equity.

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982 AER, *Explanatory Statement Rate of Return Guideline*, December 2013, p. 28.

983 We note that SFG itself does not claim the return on equity estimates from its DGM construction are more accurate, it only claims they are more stable and reliable (see: SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 2, 48; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 7). We do not consider estimates that are more stable over time are necessarily more accurate.

984 McKenzie and Partington, *Report to the AER: The DGM*, December, 2013, p. 5.

985 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.

986 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 7, 24.

987 For example, see SFG, The *required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon and Transend*, 27 May 2014, pp. 62–63 (SFG, The *required return on equity for regulated gas and electricity network businesses*, 27 May 2014); SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 63; NERA, *Return on capital of a regulated electricity network: Report for Ashurst*, May 2014, p. 105. Also see: 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.

For example, one could obtain a 20 per cent market value return on equity by setting the book value return on equity to 30 per cent and the reinvestment rate to 56.7 per cent.[988] We recognise this is an extreme example. SFG has attempted to filter out 'unrealistic' results by constraining the available choices and requiring its estimates to meet certain criteria. However, this approach is still subject to the following limitations:

- Despite the existence of filtering criteria, SFG's DGM has still produced unrealistic results. In particular, SFG's DGM produces a long term dividend growth rate that is greater than long term growth in GDP. This does not make sense. In the long term, if aggregate dividends outgrew the overall economy, the stock market would grow larger than the overall economy. McKenzie and Partington supported this view.[989]
- SFG's approach alters the assumptions that are employed, it does not eliminate them. As McKenzie and Partington described:[990]

> the result is that assumptions about the long term growth rate are replaced by assumptions about how the massive set of available choices should be filtered. Since the available set of choices is limitless, the exact result we get will also be determined by how coarse a grid we apply in initial selection of the choices that we allow to enter the filtering process.

- McKenzie and Partington showed we could apply reasonable alternative filtering criteria that could considerably change the results of SFG's DGM. For example, it is plausible to assume, at some future date, the market value return on equity will equal the book value return on equity.[991] This is equivalent to assuming investments have a zero net present value. They described this as, 'an attractive assumption because it describes the natural outcome of competition'.[992] McKenzie and Partington imposed this constraint on SFG's estimates and price/earnings model and estimated a market value return on equity of 6.9 per cent.[993] McKenzie and Partington found:[994]

> This result gives a considerably lower cost of equity than SFG's estimate, but gives exactly the same PE ratio. The point is that with simultaneous estimation, what you get will depend on the assumptions that underlie your filters. We

[988] Note that in SFG's reports, it refers to the market value return on equity as the 'cost of equity' and the book value return on equity as the 'return on equity'. We use the market value return on equity to derive our implied MRP estimate.

[989] McKenzie and Partington, *Report to the AER: The DGM*, 14 December 2013, p. 13

[990] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 35; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 54.

[991] McKenzie and Partington adopt SFG's terminology by calling the market value return on equity, the 'cost of equity' and the book value return on equity the 'return on equity'. We refer to the 'return on equity' as the market value.

[992] 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.

[993] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 35; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 54–55.

[994] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 35; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 55.

> would argue that the assumption underlying our filter is at least as plausible as SFG's and provides a result that explains the PE ratio just as well.

We consider the above reasoning suggests that endogenous growth models such as SFG's DGM do not necessarily produce more accurate or reliable estimates than standard DGMs. We consider SFG's DGM alters where one has to make assumptions, it does not eliminate them. SFG has not responded to these views in its 2015 report.

In addition to not being satisfied with endogenous growth models in general, we are not satisfied with the particular DGM SFG has put before us. This is for the following reasons:

- The endogenous growth rate SFG uses gives an implausibly high long term dividend growth rate which is greater than the long term GDP growth rate, averaging at about 5.8 per cent.[995] We consider the expected long term GDP growth should be an upper bound for the long term growth in aggregate dividends. Further, the upper bound for the growth in DPS should be even less. Lally has advised that this reflects the impact of new share issues (net of buybacks) and the formation of new companies.[996]
- While SFG's DGM methodology has been published in a respected journal (Fitzgerald et al.), there are unexplained differences between Fitzgerald et al.'s and SFG's DGMs.[997] We consider these differences contribute to the opaqueness of the SFG's DGM and should be explained. In our November 2014 draft decisions we set out these differences, which include:
    - Unlike Fitzgerald et al., SFG does not calibrate its market value return on equity estimates with reference to firm-specific variables likely to capture risk. We note Fitzgerald et al.'s justification for calibration is that some market value return on equity estimates can contain substantial estimation errors. This can arise from noise in the data or from the modelling framework not holding for that stock.[998]
    - Fitzgerald et al. uses 3,012 combinations of market value return on equity, long term ROE and long term growth, while SFG uses 2,762 combinations.

995 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 51. In the long term, aggregate dividends cannot grow at a rate greater than growth in the overall economy. Such an outcome would result in the stock market being bigger than the overall economy in the long term. Such an outcome is not plausible as the stock market is a component of the overall economy (see: McKenzie and Partington, *Report to the AER: The DGM*, 14 December 2013, p. 13).

996 Lally, *Review of the AER's proposed Dividend Growth Model*, 16 December 2013.

997 Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., pp. 560–639.

998 Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., pp. 562, 578.

This is because the long term growth takes on a range of zero to 10 per cent in Fitzgerald et al., but only 1.0 to 10 per cent in SFG's paper.[999]

  - Fitzgerald et al. uses a residual income model, while the SFG model is not.[1000]
  - Fitzgerald et al. holds the dividend payout ratio constant over year one to nine, while in the SFG's paper the payout changes over time.[1001]

- In its DGM, SFG imposed unexplained restrictions on the data. For instance, SFG assumed that growth in shares cannot be negative.[1002] This assumption seems unrealistic given share buybacks are widely used.

SFG has not explained the above differences between Fitzgerald et al.'s and SFG's DGM in its 2015 report. It has also not explained its assumption that growth in shares cannot be negative.

B.2.3 Term structure of interest rates

Our preferred construction of the DGM assumes that the discount rate does not have a term structure. However, we recognise that a term structure is likely to exist, and this has the potential to materially change our return on equity estimates under the DGM. Specifically, since the risk free rate is relatively low in the current market, our construction of the DGM will likely produce upwardly biased estimates of the MRP.[1003]

Assuming no term structure means there is a single discount rate rather than a different discount rate for each future period. This means at any given point in time, the return on equity for the market is constant for all future periods in the DGM.[1004] While this is a strong assumption, analysts commonly apply it to DGMs.[1005] We do not apply a term structure for the following reasons:

[999] SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, p. 13; Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., p. 572.

[1000] Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., p. 573.

[1001] Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., p. 575.

[1002] SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, p. 11.

[1003] Lally, *The DGM*, 4 March 2013.

[1004] This means, at a given point in time, there is a uniform expectation of the return on equity across all periods in the DGM. However, this uniform expectation can change as one moves through time, because factors such as dividend forecasts, share prices or the expected growth rate in GDP can change over time. Therefore, when estimating the return on equity for the market at any given point in time, our DGM assumes that this estimate applies to all future periods. However, this does not mean our DGM always produces the same return on equity estimates for the market.

[1005] Lally and CEG both agree analysts generally adopt a flat term structure for the market value return on equity. CEG, *Response to AER Vic Gas Draft Decision: Internal Consistency of MRP and Risk Free Rate*, 2012, pp. 37–41; Lally, *Review of the AER's proposed DGM*, 16 December 2013, p. 12.

- It is not standard practice to apply a term structure to DGMs.[1006]
- Applying a term structure to a DGM will materially increase its complexity. For instance, we would need to undertake more analysis to determine how the return on equity changes over time. Further, we would also need to determine an additional parameter to implement the DGM. This is supported by McKenzie and Partington, who advised:[1007]

> even if we knew that there was a term structure, we would have the problem of estimating the cost of equity that was to apply to the more distant cash flows. It is a difficult enough problem estimating one cost of equity, without complicating that problem by requiring estimation of another cost of equity to apply at the end of the growth transition period.

- McKenzie and Partington observed, 'the existence of an equity term structure remains an open question in the research literature'.[1008] SFG agreed with this view in its 2015 report.[1009]
- We consider it is unclear whether the return on equity in a DGM with a term structure will be any more accurate than a DGM with a flat term structure. For instance, even if we were certain of a term structure, estimating the return on equity for more distant cash flows would be very difficult. This leads McKenzie and Partington to agree with SFG in observing:[1010]

> There is the risk that the regulated rate of return varies by substantial amounts over time because of estimation error, associated with whether a term structure exists and the assumption about the long term cost of equity.

While we do not include a term structure in our DGMs, we have regard to the fact that a term structure is likely to exist. We recognise, due to its likely existence, our DGMs are likely to overestimate the MRP in relatively low interest rate environments (such as the current environment). Similarly, our DGMs are likely to underestimate the MRP in relatively high interest rate environments. We base this on the following factors:

1006 See NERA, *Prevailing Conditions and the Market Risk Premium: Report for APA Group, Envestra, Multinet and SP Ausnet*, March, 2012, p. 34; NERA, *The Market, Size and Value Premiums: A Report for the Energy Networks Association*, June 2013, p. 50. Further CEG notes that a flat term structure is generally adopted by analysts, and Lally concurs with this statement. See Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, p. 12.

1007 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. 36; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 56.

1008 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 36; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 56.

1009 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 5–6.

1010 McKenzie and Partington and SFG call the market value return on equity, the 'cost of equity'. SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 20; 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.

- Lally advised we adopt a term structure within our DGM. He noted that a DGM with a constant term structure implies the 'forward' rates of the cost of equity for the market are all the same.[1011] This implies the sum of the current 10 year risk free rate and MRP equals the sum of the current expectations of their values in 10 years' time. Therefore: [1012]

> if the current ten year risk free rate were unusually low relative to its long-term average, and therefore could be expected to be higher in ten years' time, then the current ten-year MRP would have to be unusually high relative to its long-term average by an exactly offsetting amount. This 'perfect-offset' hypothesis is implausible.

- Lally then used an example to illustrate the potential consequences of not including a term structure in a DGM. He concluded that:[1013]

> This example demonstrates that, when the MRP and the risk free rate are negatively correlated but the changes are less than perfectly offsetting, the DGM with an assumed constant market cost of equity will overestimate the MRP when the risk free rate is unusually low (as is presently the case) and the overestimation may be very significant.

- McKenzie and Partington, 'recommend that it be borne in mind that the existence of a term structure could materially change cost of equity estimates from the DGM'.[1014]

B.2.4 Two and three stage models

We use two and three stage DGMs to inform our estimate of the MRP.

We use a three stage model because we consider the three stage model more plausible. This is because we expect it to take some time for the short term growth in dividends to transition to the long term growth.

In addition to the three stage model, we also consider a two stage model for the following reasons:

- We retain the two stage model as a check on the three stage model given the limitation of how we calculate short term growth in the three stage model. Under the three stage model, we calculate shorter term growth as the geometric average growth of dividends between the financial year currently and two years in the future. If the growth in dividends in the two years is abnormally high (low), either

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1011 Lally calls the market value return on equity, the 'cost of equity'. Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, p. 11.

1012 Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, pp. 11–12.

1013 Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, pp. 11–12.

1014 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.

due to low (high) dividends in year zero or high (low) dividends in year two, this will cause the initial short term growth in the two stage model to be abnormally high (low). This in turn causes the growth in all years of transition to be abnormally high (low). As a result, given the way the short term growth rate is calculated, the two stage model should be used as a cross check. Alternatively, if we were to only use a three stage model, we would also develop different methods for calculating the short term growth for dividends.

- A three stage model may be conceptually better than a two stage model. However, its relative accuracy depends on how closely the model's pattern of transition reflects reality. While our model uses a linear transition, this may not necessarily reflect reality. For instance, McKenzie and Partington advised:[1015]

> Clearly, if growth rates are expected to be negative during the transition phase, then assuming that they are positive and steadily declining to the long term rate is likely to give a worse result than the two stage model. The point is that the expected transition might not be a steady linear adjustment, but could for example, be U shaped or inverted U shaped, V shaped, or might involve exponential decay.

- The relative accuracy of a three stage model also depends on how closely our estimated length of transition reflects reality. We estimate an eight year transition period. However, there is no consensus among experts on this. For instance, SFG adopted an eight year transition.[1016] However, McKenzie and Partington recommended a transition of three to five years based on the length of business cycles.[1017] SFG submitted that business cycle data does not indicate how long it would take for a high growth firm to revert to a normal growth firm. McKenzie and Partington accepted this submission, but noted that the objective, 'is not to estimate the growth rate for a specific high growth firm, but rather to estimate the market growth rate in order to get the market cost of equity'.[1018]

- We recognise the possibility that the transition is less than our estimated eight years. Therefore, having regard to a two stage model (with no transition) allows us to consider our model's sensitivity to this.

1015 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 32; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 52.

1016 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 6; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 5.

1017 Evidence from Pagan (1998) provides an average expansionary phase of approximately three years for the Australian stock market. See McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 32; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 52. Also see Pagan, A.R. 1998, 'Bulls and bears: a tale of two states', Walras-Bowley Lecture, Montreal.

1018 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. 33; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 52.

In its 2015 report, SFG submitted that we should not consider estimates from our two stage model. It considered using our two stage model as a 'cross check' has no basis. That was because, according to SFG, market value return on equity estimates from the two stage model are always lower than those from the three stage model.[1019] It also considered that we provide no indication of what this cross check means.[1020] We disagree. We consider it is useful to consider estimates from the two stage model as well as the three stage model, for the reasons described above. We also provide our reasoning above for why and how we use the two stage model as a check on the three stage model.

B.2.5 Consensus dividend forecasts

We use overall market consensus dividend forecasts in our preferred construction of the DGM. This entails obtaining the daily consensus dividend forecasts for the ASX 200 index. We average these forecasts on a monthly basis and apply them directly to the DGM to determine the MRP.

On the other hand, in its 2014 report, SFG proposed an approach that entails initially estimating the market value return on equity using individual analyst forecasts.[1021] Using individual analyst forecasts (of dividends) allows them to be matched with the price observed close to the same date. However, it significantly increases the complexity of SFG's DGM construction. We do not accept SFG's approach. In short, we consider the potential benefits from this approach are very limited, given its increased complexity (see section B.2.2 for a discussion on the costs of complexity).

We consider SFG's approach adds a significant amount of complexity to the DGM because it entails going through the following steps:

a. Apply the DGM to determine the implied market value return on equity for a given analyst report on a given business at a given point in time. Repeat this for each analyst forecast.

b. Aggregate all the analysts' market value return on equity estimates over a six month interval on a given business to determine the market value return on equity for that business over a six month interval. Repeat this for each business.

c. Estimate a half yearly market value return on equity for the market portfolio by taking the weighted average of the individual businesses market value return on equity over a six month interval.

1019 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 16. 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'.

1020 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 5.

1021 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 8. 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'.

d. Determine a MRP for a six month interval by subtracting the prevailing risk free rate.

We do not consider this high level of complexity justified. In particular:

- Benefits from time matching individual analyst forecasts (of dividends) to price data are questionable. This is because SFG averages over the individual analysts' (and individual businesses') market value return on equity estimates to determine a half yearly market value return on equity estimate. This averaging process may eliminate much of the benefit from matching individual analyst forecasts with price data.
- Both approaches appear to produce similar estimates of the market value return on equity, on average.[1022] SFG has also observed this.[1023] We question the benefit of estimating the return on equity over 128 million times when we can obtain, on average, a similar result by estimating the return on equity once monthly using consensus forecasts.[1024]
- While SFG has found its approach decreases dispersion in market value return on equity estimates:[1025]
    - Dispersion is not necessarily problematic—particularly to the extent that the actual return on equity may be volatile.
    - SFG's estimates will be less volatile than our monthly estimates because SFG averages its individual market value return on equity estimates to determine semi-annual estimates (we use two-monthly estimates).[1026]
    - McKenzie and Partington have observed that, expressed as a percentage of the mean return on equity, the reduction in volatility under SFG's approach is about a quarter of one per cent (0.26 per cent). In their view, treating this difference as material would be attaching more precision to DGM estimates than warranted.[1027]
- McKenzie and Partington have observed that analysts make sluggish adjustments to the information in prices. For this reason, matching the dates of analysts' forecasts and prices will not necessarily match the information in the analysts' forecast and prices. Matching information sets would require using lagged prices. However, the appropriate lag is unknown. Even if we knew the appropriate lag, it could vary across analysts and time.[1028]

[1022] By 'both approaches' we mean SFG's model with consensus forecast and SFG's model with individual analyst forecasts.

[1023] SFG, *Dividend discount model estimate of the cost of equity*, 19 June 2013, p. 10.

[1024] We use daily data, which we average across the month before applying it to our DGM.

[1025] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 8.

[1026] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 50.

[1027] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 32; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 51.

[1028] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 31; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 51.

- Further, we consider that SFG's approach is more likely to contain out-dated forecasts than our approach. Under consensus forecasts, dividends for a given firm are the simple average of each analyst's latest forecast. Consequently, as an analyst updates their forecast, their old forecast drops out of the consensus. While an analyst may have produced its latest forecast many months earlier, this does not mean it is necessarily out-dated. That is, just because share prices change on a continuous basis does not mean analyst dividends forecasts change—share prices could change for a range of reasons. However, under SFG's approach, it averages all forecasts over six months. This includes out-dated forecasts and gives greater weight to analysts that revise their forecasts more frequently.[1029] SFG has not provided reasons for doing this. Further, this approach is not consistent with Fitzgerald et al., which state, 'in the event that the analyst has issued multiple earnings and target prices within a half-year, we use the analyst's most recent set of forecasts'.[1030]

In its 2015 report, SFG changed its approach to average all forecasts over two months instead of six.[1031] SFG submitted that this change was in response to our view that SFG's six month averaging process is likely to include outdated analyst forecasts. We consider SFG's new approach may mitigate the problem of outdated analyst forecasts in its market value return on equity estimates to some extent. However, this does not rule out the possibility that one analyst may make more than one forecast in a given two month averaging period. In this case, SFG's approach will still give greater weight to analysts that revise their forecasts more frequently. SFG has not explained why this is preferable to giving analysts equal weight. We also maintain most of our other views set out above, and maintain our consideration that the high level of computational intensity from using individual analyst forecasts is not justified. For example, we consider:

- The benefit of using individual analyst forecasts is still questionable because SFG averages over its individual market value return on equity estimates to determine a two-monthly market value return on equity estimate.
- Both approaches appear to produce similar estimates of the market value return on equity, on average.[1032] Even at this time, SFG's latest DGM estimate of the MRP is 8.3 per cent when using our preferred imputation adjustment.[1033] This is very

[1029] If an analyst covering a firm revises its forecast over the six month period, SFG's estimate would incorporate both the old and revised forecast. See SFG, *Dividend discount model estimate of the cost of equity*, 19 June 2013, p. 10.

[1030] Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., p. 581.

[1031] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 22.

[1032] By 'both approaches' we mean SFG's model with consensus forecast and SFG's model with individual analyst forecasts.

[1033] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 27.

similar to our three stage DGM estimate of the MRP of 8.2 per cent for the two months to end– February 2015.

- Dispersion is not necessarily problematic—particularly to the extent that the actual return on equity is volatile. SFG submitted that this view is inconsistent with regulatory precedent, because we have always estimated the MRP at 6.0 or 6.5 per cent.[1034] However, we do not use our DGM to estimate the MRP in isolation. We consider a range of information sources, placing most reliance on historical excess returns. We recognise that the return on equity for the market (and the MRP) can change over time. We consider our DGM estimates can more readily reflect changes in market conditions (and the MRP) than historical excess returns estimates, but may not track these changes accurately (see step two of section 3.4.1). While SFG's DGM estimates may exhibit less dispersion, we are not satisfied that this implies they track changes in market conditions (and the MRP) more accurately.
- McKenzie and Partington have observed that analysts make sluggish adjustments to the information in prices. For this reason, matching the dates of individual analysts' forecasts and prices will not necessarily match the information in the individual analysts' forecast and prices.[1035] SFG submitted that an observation only enters its dataset if the price target is released within a 28 day window of the analyst earnings forecast.[1036] SFG considered that this allows it to estimate the market value return on equity that is inferred from an analyst's forecast of earnings made with the same information as the analyst's estimate of a fair share price. However, we consider market prices should be used in DGMs, not analyst's target prices (see section B.2.6). Therefore, we continue to consider that matching individual analyst forecasts to prices would require using lagged prices. However, the appropriate lag is unknown, and even if we knew the appropriate lag, it could vary across analysts and time.[1037] Additionally, SFG noted that, on average, market value return on equity estimates based upon time matched analyst forecasts and prices are about the same as market value return on equity estimates based upon consensus forecasts.[1038] However, it also submitted that these estimates are not the same throughout the entire time period as using consensus forecasts (and not time matching dividends and prices) increases the dispersion of estimates. As explained above, we consider dispersion is not necessarily problematic, and are not satisfied that matching the dates of analysts' forecasts and market prices will result in more accurate return on equity estimates.

[1034] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 27.

[1035] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 31; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 51.

[1036] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 23–24.

[1037] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 31; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 51.

[1038] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 27.

B.2.6 Market prices

We consider market prices should be used in DGMs. DGMs are discounted cash flow models based on the assumption that the current price of a share is equal to the discounted value of all expected future dividends. According to DGMs, an investor should be indifferent between receiving the market price of the share today and receiving the expected dividend of the share over the life of the asset. Both SFG's and our DGMs are instances of the following equation:

$$P_0 = \frac{E(D_1)}{(1+k)^1} + \frac{E(D_2)}{(1+k)^2} + \frac{E(D_3)}{(1+k)^3} + \frac{E(D_4)}{(1+k)^4} + \cdots$$

In its 2014 and 2015 reports, SFG submitted that we should use target prices in this equation.[1039] These are the stock prices that an analyst expects to arise over the next 12 months. However, we consider that market prices should be used instead. This is for the following reasons:

- It is standard practice to use market prices in DGMs.[1040]
- If we use target prices in our DGM, the return on equity estimate will reflect analysts' views rather than the market's view on the return on equity.[1041] McKenzie and Partington found this would be appropriate if the objective was to discover analysts' implicit discount rates. They noted this would be, 'rather like an implied opinion survey of analysts'.[1042] However, McKenzie and Partington observed the objective is to obtain the market's implied return on equity.[1043]
- McKenzie and Partington advised that using target prices to infer analysts' discount rates could be problematic. This is because some analysts do not use DGMs to form their target prices. For instance, some would use price earnings multiples applied to forecast earnings, and some would use other methods.[1044]
- Under a DGM, an investor should be indifferent between receiving the market price of the share today and receiving the expected dividends of a share over the life of the asset. However, the target price of a share is not a current share price forecast. Instead the target price reflects an analyst's view of what the share price might be

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1039 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, pp. 7–12; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 22–23.

1040 Although SFG proposes using target prices, it recognises it is more common to use market prices, particularly when consensus dividend forecasts are used (which is what we use in our preferred DGM construction). See SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 8.

1041 SFG disagreed with this view in its 2014 report. It submitted that regardless of whether we use the market price or the target price, we are still making an estimate of the market-implied cost of equity (SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 9).

1042 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 30; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 50.

1043 McKenzie and Partington, *Report to the AER: The DGM*, December 2013.

1044 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 30; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 50.

over the next 12 months. That is, the target price represents the analysts' expectation of the share price.[1045] Regardless of SFG's assumptions, investors do not have a choice of receiving the target price today or receiving the stream of dividends over the life of the asset. As a result, the indifference equality relationship in the general DGM equation does not hold if target prices are used.

In its 2014 and 2015 reports, SFG submitted there is value in using target prices rather than market prices.[1046] It noted that analysts' earnings and dividend forecasts could reflect a degree of optimism or pessimism. The analyst's price target also, presumably, reflected this sentiment. SFG has also noted there are studies which report that analyst earnings expectations are optimistic.[1047] SFG considered that by using target prices, this could offset bias in analyst dividend forecasts.[1048] We do not agree with this view for the following reasons:

- If analysts' dividend and price forecasts are biased, it is also plausible that the analysts' implied return on equity is biased. In turn, this raises concerns about SFG's methodology of reverse engineering analysts' estimates of the market value return on equity.[1049] The return equity estimate may have a bias similar to the dividend and price forecasts.
- If there is a bias in analyst forecasts, one possible approach would be to adjust for the bias in the analyst dividend forecasts. Under such an approach, the return on equity estimate from the DGM would be unbiased and would accurately reflect the market's views of the return on equity. However, we consider such an adjustment is likely to be complex and there is no accepted method to do so. For this reason, we do not apply an adjustment. However, to the extent there is an upwards bias in the dividend forecasts, this could bias the return on equity estimate from our DGM upwards. McKenzie and Partington considered analysts' forecasts are upward biased.[1050] Therefore, we consider stakeholders should view our DGM estimate of the MRP as an upper bound.

SFG did not respond to the above views in its 2015 report. Instead it stated that:[1051]

[1045] Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., p. 570.

[1046] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, pp. 11–12; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 22–23.

[1047] SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, p. 10.

[1048] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 22–23.

[1049] 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'.

[1050] 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, p. 46; McKenzie and Partington, *Report to the AER: The DGM*, December 2013, pp. 8–9.

[1051] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 23.

> the AER has never performed a computation using analyst forecasts, price targets, or share prices, to illustrate the potential bias, or made any other attempt to estimate the cost of capital in a manner that accounts for potential bias.

We explain why we do not adjust for the bias in analyst dividend forecasts above. Also, McKenzie and Partington's have written that 'a well-established literature finds clear evidence that analysts' forecasts are overly optimistic with respect to target prices, earnings and dividends'.[1052]

B.2.7 Assessment of dividend growth models against our criteria

In the Guideline, we set out the criteria for assessing the merits of the various sources of information in setting the allowed rate of return. We noted decisions are more likely to meet the allowed rate of return objective if they use estimation methods, financial models, market data and other evidence that meet these criteria.[1053]

Several service providers proposed SFG's construction of the DGM. We have assessed SFG's and our construction of the DGM against the criteria set out in the Guideline.[1054] Table 3-30 shows our construction of the DGM has less limitations than SFG's construction.

Table 3-30 Assessing dividend growth models against criteria

Criteria	DGMs in general	AER's construction	SFG's construction
Where applicable, reflective of economic and finance principles and market information. Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust	DGMs are based on the finance principle that markets are efficient and the present value of a share reflects the discounted value of its expected future dividends.	Exogenously estimates long term growth in DPS, which is common practice when applying DGMs. We estimate this input on expected long term growth in real GDP, adjusted for new share issuance (net of buybacks) and the emergence of new	Endogenously estimates the dividend growth rate, which has some academic support but is not common practice. While a well-respected journal has published a similar approach to SFG, there are unexplained differences in SFG's

[1052] McKenzie and Partington, *Report to the AER: The DGM*, December 2013, p. 4.

[1053] AER, *Rate of return guideline*, 17 December 2013, p. 6.

[1054] Jemena Gas Networks, ActewAGL, Ausgrid, Essential Energy, Endeavour Energy, TransGrid, SA Power Networks, Ergon Energy and Energex submitted we consider SFG's DGM set out in: SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014; and SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013. SFG again proposed its DGM construction in its 2015 report: SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, section 5.

Criteria	DGMs in general	AER's construction	SFG's construction
data		companies. This recognises it is implausible for dividends to grow larger than the economy in perpetuity.[1055]	DGM.[1056] Its results do not make sense as they suggest dividends outgrow the economy in perpetuity.
Fit for purpose. That is, 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. Also, promote simple over complex approaches where appropriate	While DGMs are used to price shares, they can also estimate the return on equity. While DGMs are used in the Australian context, their use appears limited compared to the SLCAPM.[1057] DGMs can be simple or complex, depending on how they are constructed.	Fit for purpose. The AER constructed this DGM for the purpose of informing regulatory decisions. It is also simple to implement.	Fit for purpose if it uses market prices instead of target prices. Otherwise, estimates will reflect analysts' views rather than the market's view on the return on equity. SFG's DGM is unusually complex—its approach to estimating the MRP over 10.5 years requires over 128 million computations.
Implemented in accordance with good practice. That is, supported by robust, transparent and replicable analysis that is derived from	DGMs rely on market data. Therefore, if the methodology is transparent, it is possible to	We are transparent about our DGM. Its simplicity enables stakeholders to apply it in a replicable manner.	While SFG is transparent about its DGM, it is so complex that we consider most stakeholders would have significant difficulties in

1055 Lally, *The dividend growth model*, 4 March 2013, p. 13.

1056 Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., pp. 560–639.

1057 DGMs do not appear widely used in the regulatory context. We note that while IPART uses DGMs to inform its estimate of the MRP, it considers this along with additional information like historical excess returns. See IPART, *Review of WACC methodology: Research final report*, 9 December 2013, p. 2. Regarding market practitioners, we considered 32 independent valuation reports dated between 27 April 2013 and 31 July 2014 that contained a discounted cash flow analysis. All but four of these reports used a model other than the SLCAPM (the DGM) to estimate the return on equity. Three of these four reports only used the DGM as a cross-check on an initial SLCAPM estimate. The remaining report used the DGM to directly estimate the value of the proposed transaction). See: DMR Corporate, *Re: Independent Expert's Report*, Report prepared for ILH Group Ltd, 23 July 2013, Grant Samuel & Associates Ltd:, *Financial Services Guide and Independent Expert's Report in relation to the proposal by Murray & Roberts Holdings Ltd*, 11 October 2013; *Financial Services Guide and Independent Expert's Report in relation to the proposal to internalise management*, 7 February 2014; *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-Committee in relation to the proposal by APA Group*, 4 March 2014.

Criteria	DGMs in general	AER's construction	SFG's construction
available credible datasets	replicate results.		replicating the results.[1058]
Where models of the return on equity and debt are used these are based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in inputs estimation. These are also based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound rationale.	DGMs are highly sensitive to assumptions.[1059] This includes assumptions about the long term dividend growth rate and the length of transition to long term growth. Results are also sensitive to errors in analyst forecasts. McKenzie and Partington consider DGMs can produce upward biased estimates.[1060]	Highly sensitive to our assumption on the long term DPS growth rate. However, we are transparent about how we derive this assumption. Our results are also sensitive to errors in analyst forecasts. McKenzie and Partington consider our DGM is likely to produce upward biased estimates.[1061]	Estimates long term DPS growth endogenously using market data. However, for a given price/earnings ratio, this can produce any estimate based on assumptions on the reinvestment rate and return on equity. While this model filters nonsensical results by requiring estimates to meet certain criteria, these criteria are quite broad.[1062] For instance, it allows 10% long term DPS growth, although this is implausible. SFG filters data by assuming growth in shares cannot be negative.[1063] It also assumes price/earnings ratios

1058 Professor Michael McKenzie and Associate Professor Graham Partington have advised that due to its complexity, they are doubtful that they could exactly reproduce SFG's results given the same data set. See: McKenzie and Partington, *Report to the AER: The DGM*, 14 December 2013, p. 21.

1059 McKenzie and Partington, *Equity market risk premium*, December 2011, p. 25; AER, *Final decision: APA GasNet*, March 2013, p. 101.

1060 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 26, 28–30; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 46–50.

1061 They consider this is due to factors such as optimistic analyst dividend forecasts, stickiness with dividends and the practice of financing dividends. They also consider our estimate of the long term dividend growth rate is 'on the high side'. See: McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 26, 28–30, 34; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 46–50, 54, 59.

1062 Criteria include: Long term DPS growth between 1–10%, market value return on equity between 4–20%, long term book value return on equity 3–30%. Combinations of parameters must lead to an intrinsic price within 1% of the analyst target price. Picks the combination where year 10 DPS growth best matches long term DPS growth.

1063 This causes SFG to remove 20% of its data. We consider this unrealistic because share buybacks are widely used.

Criteria	DGMs in general	AER's construction	SFG's construction
			cannot be negative.[1064] SFG's results are also sensitive to errors in analyst forecasts.
Where market data and other information is used, this information is credible and verifiable, comparable and timely and clearly sourced	Uses market data that are timely, well sourced and verifiable. However, evidence suggests analyst forecasts are sluggish and overly optimistic.[1065]	Market data are well sourced and verifiable. Consensus forecasts may contain analyst forecasts produced months earlier, but these may not be out-dated.	Market data are well sourced and verifiable. In 2014, SFG used analyst forecasts over 6 months. In 2015, SFG used analyst forecasts over 2 months. When analysts revise their forecasts, it includes the out-dated forecasts as well.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	Theoretically, readily reflects changes in the market data as it reflects changes in dividend forecasts and share prices. However, in practice, may not track these changes accurately.[1066] DGMs can generate volatile and conflicting results.[1067]	Averages estimates over 2 months. If the DGM produces accurate estimates, these will reflect changing market conditions.	In 2014, SFG averaged estimates over 6 months. All else equal, Averages estimates over 2 months. All else equal, this will capture changing market conditions less than the AER's DGM. However, averaging over 6 months could improve estimates by reducing noise. In 2015, SFG averaged estimates over 2

1064 We consider this unrealistic because firms may have negative earnings at any given point in time. Also, Fitzgerald et al. does not make this assumption.

1065 McKenzie and Partington, *The DGM*, December 2013, pp. 8–9; 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.

1066 This is due to factors such as sluggish (and optimistic) analyst dividend forecasts, stickiness with dividends and the practice of financing dividends. See: 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.

1067 Different consultants have produced widely different DGM estimates over short periods. From March 2012–2013, we received DGM estimates of the MRP ranging from 5.90–9.56 per cent. See: AER, *Final decision: Access arrangement final decision: SPI Networks (Gas) Pty Ltd 2013-17*, March 2013, Part 2, pp. 101–103, Part 3, 50–56.

Criteria	DGMs in general	AER's construction	SFG's construction
			months, similar to the AER's DGM. However, averaging over 2 months increases noise and may introduce error because there will be less analyst forecasts to average over in a given 2 month period.

B.3 Reasons for estimating the market risk premium

We employ our construction of the DGM to inform our estimate of the MRP.[1068] This is consistent with the Guideline, where we considered DGM estimates of the MRP as a useful source of evidence.[1069] In the Guideline, we expressed we would employ the DGM to inform the MRP because we considered data from DGMs were sufficiently robust for this purpose. However, while DGMs are theoretically sound, there are many limitations associated with their practical implementation. In the Guideline (and our November 2014 draft decisions), we gave the following key reasons for limiting the use of the DGM to estimating the MRP:

- A sufficiently robust data series exists for dividend yields in the Australian market. Whereas, there are insufficient data to form robust estimates of the required return on equity for Australian energy network service providers.[1070] There are difficulties with constructing credible datasets for implementing industry specific DGMs.[1071] Also, there are too few Australian businesses to perform DGMs on an individual business level.[1072]
- There are developed methods for estimating the growth rate of dividends in the Australian market.[1073] Whereas, it is unclear if there is a sufficiently robust method for estimating the long term dividend growth rate for Australian energy network service providers.[1074]

1068 The DGM produces an estimate of the return on equity for the market. The MRP estimate is calculated by subtracting the prevailing risk free rate from the DGM estimate of the return on equity for the market.

1069 AER, *Rate of return guideline*, December 2013, pp. 13, 16.

1070 AER, *Explanatory Statement to the rate of return guideline (appendices)*, December 2013, p. 15.

1071 AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 77.

1072 AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 119.

1073 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.

1074 AER *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 15.

- There are important limitations of DGMs that limit our ability to use them as a foundation model. For instance, DGMs can have limited robustness given they are highly sensitive to input assumptions regarding short and long term dividend growth rates. This makes DGMs highly sensitive to potential errors in inputs. Further, DGM estimates of the MRP are highly sensitive to changes in the risk free rate and may generate volatile and conflicting results. For example, we have observed that, over extended periods of time, DGMs generated significantly higher average returns on equity for network businesses than for the Australian market. We consider this fails a sanity test as the systematic risk of network businesses is less than the overall market.[1075]

In contrast, some service providers submitted we should use empirical estimates from the DGM in estimating the allowed return on equity for a benchmark efficient entity.[1076] We have reviewed the material submitted since the Guideline. However, we maintain the view that DGM estimates of the return on equity for a benchmark efficient entity are currently unsuitable for our regulatory task (see appendix A–equity models). We engaged McKenzie and Partington to provide advice on the DGM in light of service providers' recent proposals and revised proposals. In their 2014 and 2015 reports, McKenzie and Partington supported our decision not to use DGMs to directly estimate the return on equity.[1077] They did support using our construction of the DGM to inform the MRP estimate. However, they raised concerns around the reliability of DGMs and gave a number of reasons why DGMs are likely to overestimate the return on equity and MRP at the current time.[1078]

In its 2014 and 2015 reports, SFG submitted its construction of the DGM could produce estimates that we could use for the Australian market as a whole, and at the industry level.[1079] However, we consider SFG has overstated the ability of its DGM to provide robust return on equity estimates at the industry level. We set out our reasons for forming this position in the following paragraphs.

[1075] AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 120-122.

[1076] TransGrid, *Revised revenue proposal*, January 2015, pp. 8–9 (TransGrid maintains the position set out in its initial revenue proposal, see: TransGrid, *Revenue proposal*, May 2014, p. 12); ActewAGL, *Revised regulatory proposal*, January 2015, pp. 447–448, 468; JGN, *Revised access arrangement proposal—Appendix 7.1 Return on equity response*, February 2015, pp. 36–37; Ausgrid, *Revised regulatory proposal*, January 2015, p. 197; Essential Energy, *Revised regulatory proposal*, January 2015, pp. 241–242; Endeavour Energy, *Revised regulatory proposal*, January 2015, pp. 223–224; Ergon Energy, *Regulatory proposal—Appendix C: Rate of return*, October 2014, pp. 135–136; Energex, *Regulatory proposal*, October 2014, pp. 164–165; SAPN, *Regulatory proposal*, October 2014, p. 319. These service providers submitted using the DGM set out in SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014.

[1077] 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. 58–60.

[1078] McKenzie and Partington, *Report to the AER Part A: Return on Equity*, October 2014, pp. 26–41; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 46–60.

[1079] 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.

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.[1080] 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 DGMs.

However, there is a large dataset of analyst forecasts available for the Australian market as a whole. While the DGM might overestimate the return on equity for some firms on the market, it might underestimate the return on equity for other firms. Given a large sample size, on aggregate, estimation errors on the return on equity for individual businesses may cancel out. If so, this should produce an unbiased return on equity estimate for the entire market. McKenzie and Partington concurred with this. However, they also considered there was a significant risk that the DGM would overestimate the MRP. Specifically, they advised:[1081]

> It is appropriate to restrict the use of DGM to informing the estimate of the market risk premium. While the DGM is probably the second most popular method of estimating the cost of equity, there is a risk of substantial error in the estimates of the cost of equity for individual firms. Averaging over many firms across the market helps reduce the impact of the error. There is, however, a significant risk that the DGM will overestimate the cost of equity for individual firms.

We consider a small sample size is problematic for any construction of the DGM. SFG, on the other hand, submitted its DGM is capable of producing reliable estimates of the return on equity for a benchmark efficient entity. We disagree.

While SFG submitted it used its DGM to directly estimate the return on equity for a benchmark efficient entity, it only used its DGM to indirectly estimate this.[1082] Specifically, SFG applied the following steps to estimate the return on equity for a benchmark efficient entity:[1083]

1. Estimate the market value return on equity for network businesses using its DGM for each of the analysts which provides 99 return on equity estimates.[1084] Then,

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1080 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 58.

1081 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. 39; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 58–59.

1082 SFG used its DGM to directly estimate the return on the market as a whole. We also use the DGM to estimate the return on the market, and therefore, the MRP.

1083 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, pp. 56–57, 59.

1084 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'.

subtract the risk free rate to obtain the equity risk premium (ERP) for each return on equity estimate.

2. Determine the risk premium ratios by dividing each of the 99 ERPs from step one by the relevant MRP from its DGM.[1085]
3. Take a simple average of the 99 risk premium ratios (determined in step two) to derive an average risk premium of 0.94.[1086]
4. Multiply the average risk premium by the prevailing MRP and add a prevailing risk free rate.

This is similar to using the average risk premium ratio as a substitute for the equity beta in the Sharpe–Lintner capital asset pricing model (SLCAPM). SFG has used its DGM to estimate an average risk premium ratio (using direct DGM estimates of the MRP and return on equity for network businesses) and has effectively inserted this into a version of the CAPM to estimate the return on equity for a network business. This is not too dissimilar to our approach. However, unlike our approach, we consider there are several technical issues. These include:

- The method used to estimate the average risk premium ratio (or effective equity beta for the SLCAPM) 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. However, SFG determined its effective equity beta as the ERP of a business divided by the MRP.
- It estimated the effective equity beta on a relatively small dataset (99 six-monthly data points). Conversely, when we estimate equity beta over 12 years, there should be about 625 weekly data points.
- It used inappropriate weightings in the estimation process because SFG's DGM gave businesses with more analyst coverage greater weight.

Further, the high estimates from SFG's DGM, equating to an effective equity beta of 0.94 in the SLCAPM, appear inconsistent with the low risk nature of regulated natural monopoly businesses with very low elasticity of demand for their services (see section D.1 of appendix D–equity beta). This is also inconsistent with Australian empirical estimates of equity beta, as reported in section D.2 of appendix D–equity beta.

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

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[1085] For instance, if there was an analyst forecast for APA on the 1st of April 2013 the DGM would determine the market value return on equity for that analyst forecast. SFG would subtract the risk free rate from the market value return on equity to determine the ERP for APA for the 1st April 2013. SFG would divide the ERP by the DGM's MRP estimate for the period 1 January 2013 to 30 June 2013 to determine the risk premium ratio. SFG would repeat this for all analyst forecasts for network businesses (99 instances in SFG’s dataset).

[1086] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 20, p. 48.

for the network businesses over the period 2002 to 2014.[1087] This is a larger sample 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.

In its 2015 report, SFG submitted that it did not give businesses with more analyst coverage more weight in its DGM analysis.[1088] However, 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 DGM gives energy network firms with more analyst coverage greater weight.

SFG disagreed with our views on its DGM based estimate of the average risk premium ratio (or effective equity beta). SFG submitted that it is inappropriate to compare its DGM approach to estimating equity beta with our approach to estimating equity beta (regression analysis of historical stock returns).[1089] However, it submitted that it is appropriate to compare equity beta estimates resulting from the two approaches, as its DGM based estimate of the average risk premium ratio has the 'same quantitative effect as a beta estimate'.[1090] We consider there are inconsistencies in SFG's reasoning.

There may be more than one way to estimate equity beta. However, using regression analysis to estimate equity beta is widely used and recognised.[1091] Therefore, we can

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1087 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.

1088 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 31.

1089 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 31, paras. 171, 172, 173(b).

1090 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 31, paras. 173(a).

1091 For example, Bloomberg, the Australian Graduate School of Management (AGSM), Morningstar and ValueLine estimate equity beta using regression analysis of stock and market index returns. Also, Grant Samuel and Associates (Grant Samuel) relied on equity beta estimates from Bloomberg and AGSM in its 2014 independent valuation report for Envestra. The Economic Regulation Authority (ERA) also estimates the equity beta using regression analysis of stock and market index returns. See: Grant Samuel and Associates, Envestra financial services guide and independent expert's report (appendix 3), March 2014, p. 6 (this shows Bloomberg and AGSM have greater confidence that our approach has been 'tried and tested'. Conversely, we have no evidence before us that SFG's DGM based approach to estimating an effective equity beta for the SLCAPM has been used by market practitioners or regulators to date.

SFG also disagreed with our view that effective equity beta estimate appears inconsistent with the low risk nature of regulated natural monopoly businesses with low elasticity of demand for their services.[1092] SFG submitted that it is not possible to conclude the benchmark efficient entity has an equity beta below 1.0 based on conceptual analysis. It also submitted that our reasoning implies we consider the equity beta must be less than 0.94. This is a mischaracterisation. We observe that an equity beta of 0.94 appears inconsistent with the low risk nature of regulated natural monopoly businesses with very low elasticity of demand for their services. We do not use our equity beta conceptual analysis to determine an upper bound of 0.94 for the equity beta. We discuss our conceptual analysis of equity beta in appendix D–equity beta.

In its 2014 and 2015 reports, SFG submitted its DGM is more reliable and less volatile than our DGM.[1093] However, this perception of stability is subjective and we do not agree with it. Figure 3-18 illustrates this point by showing three time series:[1094]

- the return on equity for the market determined by SFG's DGM (blue line)
- the return on equity for network businesses determined by multiplying the MRP from SFG's DGM 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 DGM (red line).

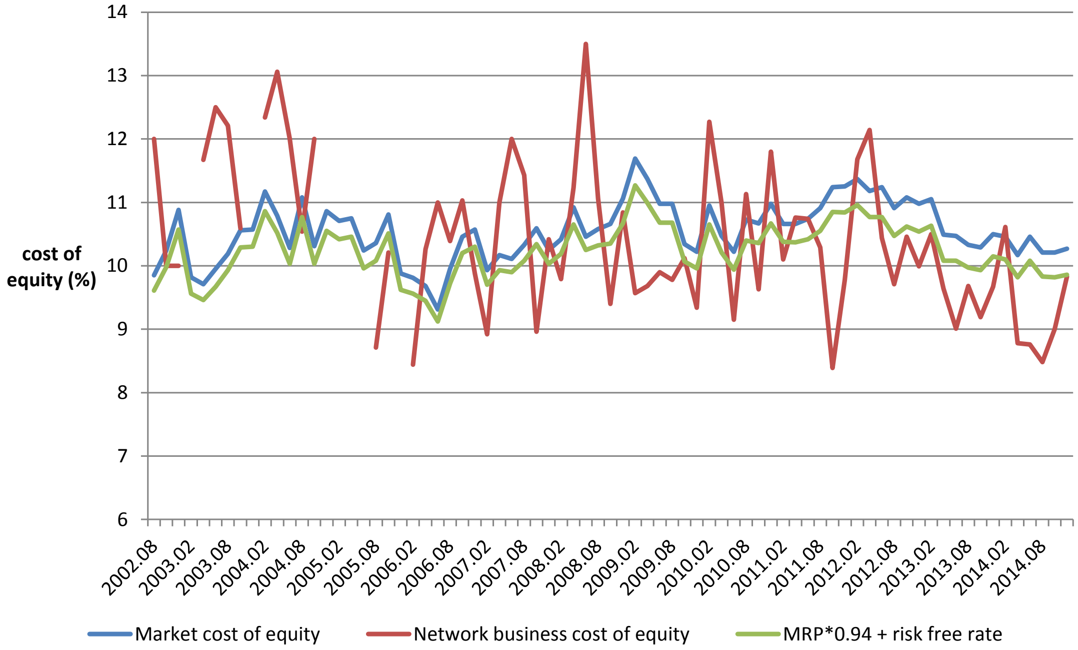
estimates); ValueLine, *Using Beta*, 2 October 2012, viewed on 16 April 2015, link: http://www.valueline.com/Tools/Educational_Articles/Stocks/Using_Beta.aspx#.VS96wNR--Uk; Morningstar, *Investing glossary: Beta*, viewed on 16 April 2015, link: http://www.morningstar.com/InvGlossary/beta.aspx; ERA, *Rate of return guideline explanatory statement*, December 2013, p. 165.

1092 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 32.

1093 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.

1094 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.

Figure 3-18 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.

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 be estimated for these periods.

Figure 3-18 illustrates that direct estimates of the return on equity for network businesses using SFG's DGM (red line) are volatile. Whereas, by construction, SFG's indirect estimates of the return on equity for network businesses using a hybrid CAPM/DGM 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.

We consider more confidence in the DGM must be developed before it can be directly applied to network businesses at a given point in time.

B.4 Prevailing estimates

For the two months up to end-February 2015, DGMs produce an estimate of the MRP within the range of 7.4 to 8.6 per cent. We construct this range from DGM estimates under different assumptions. Table 3-31 shows this.

Table 3-31 MRP estimates under dividend growth models, 0.6 theta (per cent)

Growth rate [a]	Two stage model	Three stage model
4.0	7.4	7.8
4.6	8.0	8.2
5.1	8.4	8.6

Source: Bloomberg, AER analysis.

a) See section B.2.1 for discussion on these long term dividend growth rate estimates. These estimates are based on Lally's analysis, which applies deductions of 0.5, 1.0 and 1.5 per cent to the long term expected growth rate of real GDP of 3 per cent.

B.5 Sensitivities to prevailing estimates

Evidence before us indicates the MRP implied from DGMs is very sensitive to input assumptions and likely to show an upward bias in current market conditions.[1095] While we still propose to use our construction of the DGM to inform our MRP estimate, we consider it important to have regard to the existence of this potential bias. In this section, we discuss factors we have considered. We also conduct some sensitivity analysis on our DGMs.

B.5.1 Sources of potential upwards bias in the current market

We consider our, and other, DGMs are likely to produce upward biased estimates of the MRP in the current market for the following reasons:

- DGMs use dividends as a proxy for free cash flow to equity, which is the share of the operating cash flow available for owners.[1096] There are a number of problems with this approach:
    - Differences between the free cash flow to equity and the dividend in a particular period 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

[1095] 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.

[1096] 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.

negative for a period. This is likely to result in upward biased DGM estimates of the return of equity.[1097]

  - Dividends are a smoothed version of both free cash flow to equity and profits. This is because dividends follow slowly with changes in profits. Therefore, dividends are considered to be 'sticky' and are particularly sticky downwards because companies are more averse to cutting dividends. Thus, if profits and free cash flow to equity drop, and investors revise their growth expectations downwards, the share price may drop significantly without the dividend changing. Together, this will cause a higher dividend yield, giving an upwardly biased estimate of the return on equity. The reverse occurs if profits and free cash flow to equity drop, but McKenzie and Partington consider there is likely to be an asymmetry in the effects because of the greater reluctance to cut dividends than increase dividends.[1098]

- Analyst forecasts are well understood to be upward biased.[1099] McKenzie and Partington considered analysts' forecasts are also slow to adjust to the information in prices. This, in conjunction with the other limitations set out in this section, means that DGMs may not accurately track changes in the return on equity.
- The risk free rate is currently relatively low. Lally observed that if DGMs 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.[1100] This is discussed further in section B.2.3. We consider it useful to be aware of this potential bias. This is consistent with McKenzie and Partington's advice:[1101]

> 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.

B.5.2 Sensitivity analysis

We also consider how sensitive our DGM is to the following factors:

- our long term dividend growth rate
- the period we average estimates over
- biases in analyst forecasts

1097 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.

1098 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.

1099 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.

1100 Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, pp. 11–12.

1101 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.

Long term dividend growth rate

We have used our point estimate growth rate (4.6 per cent) as a baseline. We base this on the mid-point of Lally's estimates. We have also considered the top of Lally's range (5.1 per cent). However, McKenzie and Partington advised that if anything, a long term dividend growth rate of 4.6 per cent is on the high side.[1102] McKenzie and Partington considered the long term dividend growth rate should be 3.73 per cent—or 3.78 per cent, excluding the most extreme values.[1103] We have not changed our approach set out in the Guideline. We do not adopt a lower long term dividend growth rate. However, we consider it useful to have regard to our DGM's sensitivity to different assumptions in estimating the long term growth rate. Table 3-32 sets out how these assumptions affect our estimates.

Table 3-32 Growth rate sensitivities in the MRP, 0.6 theta (per cent)

Sensitivity	Two stage model	Three stage model
5.1% growth (top of AER's and Lally's range)	8.43	8.59
4.6% growth (AER point estimate, Lally's estimate)	7.97	8.20
3.78% growth (McKenzie and Partington's estimate)	7.22	7.59

Source: Bloomberg, AER analysis.

Averaging period

We have based our DGM estimate on data over January and February 2015. However, McKenzie and Partington advised that analysts' adjustment to the information in prices is sluggish.[1104] This creates problems with time matching analyst dividend forecasts with prices. It also implies that DGMs may not track changes in the return on equity accurately. McKenzie and Partington stated:[1105]

> Indeed, we would caution against relying on month by month, or even year by year, estimates from the DGM. Averaging measurement error over several

1102 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.

1103 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'.

1104 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.

1105 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. 32; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 51.

> periods is likely to reduce the error and therefore, we would recommend taking the mean over several years. In this way the DGM could be used to get a ball park - although likely upward biased figure - for the cost of equity.

We have not changed our approach set out in the Guideline. We do not average over several years because this would reduce the tracking ability of our DGM. However, we consider it useful to have regard to our DGM's sensitivity to the averaging period. Table 3-33 shows these sensitivities. In this table, we use a two month averaging period as a baseline. We also consider a six month averaging period, which is consistent with SFG's DGM (as applied in its 2014 report). Having regard to McKenzie and Partington's advice, we also consider a 12 month averaging period.

Table 3-33 Averaging period sensitivities in the MRP, 0.6 theta (per cent)[1106]

Sensitivity	Two stage model	Three stage model
2 months to end February 2015	7.97	8.20
6 months to end February 2015	7.78	8.02
12 months to end February 2015	7.29	7.58

Source: Bloomberg, AER analysis.

Biases in analyst forecasts

McKenzie and Partington advised us that DGMs are often biased upwards because analysts tend to overestimate dividends in their forecasts.[1107] We consider it useful to have regard to our DGM's sensitivity to potential biases in analyst forecasts. In Table 3-34 we have adjusted forecast dividends per share 10 per cent downwards/upwards.

Table 3-34 DPS forecast sensitivities in the MRP, 0.6 theta (per cent) [1108]

Sensitivity	Two stage model	Three stage model
Forecast	7.97	8.20
Forecast + 10%	8.58	8.83
Forecast - 10%	7.36	7.58

Source: Bloomberg, AER analysis.

1106 Assuming we adopt our point estimate of the long term dividend growth (4.6 per cent).

1107 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.

1108 Assuming we adopt our point estimate of the long term dividend growth (4.6 per cent).

Combined sensitivities

Table 3-35 highlights the potential impact of errors in estimates and assumptions, by bringing these sensitivities together. Taken together, this highlights that DGMs can be very sensitive to assumptions and estimation errors.

Table 3-35 Combined sensitivities in the MRP, 0.6 theta (per cent)

Sensitivity	Two stage model	Three stage model
Baseline [a]	7.97	8.20
Low [b]	5.89	6.28
High [c]	9.04	9.20

Source: Bloomberg, AER analysis.

Notes: a) 4.6% growth, 2 month averaging, DPS forecasts.

b) 3.78% growth, 12 month averaging, DPS forecasts - 10%.

c) 5.1% growth, 2 month averaging, DPS forecasts + 10%.

C Market risk premium

Under the Sharpe–Lintner capital asset pricing model (SLCAPM), the market risk premium (MRP) is the premium above the risk free rate an investor would need, in expectation, to invest in the market portfolio. The MRP compensates an investor for the systematic risk of investing in the market portfolio. Systematic risk is that which affects the market as a whole (such as macroeconomic conditions and interest rate risk) and investors cannot diversify it away through investing in a wide pool of firms.

This appendix sets out why we consider our approach for estimating the 10 year forward looking MRP contributes to the achievement of the allowed rate of return objective.[1109] This appendix also shows why our approach produces an estimate of 6.5 per cent in current market conditions.

We have regard to prevailing conditions in the market for equity funds when estimating a range and point estimate for the MRP.[1110] Recognising nobody can directly observe the MRP, we have regard to these prevailing conditions by considering a range of theoretical and empirical evidence. This evidence comes from historical excess returns, dividend growth model (DGM) estimates, survey evidence and conditioning variables. We also have regard to recent decisions by Australian regulators.[1111]

C.1 Historical excess returns

Historical excess returns are the realised returns stocks have earned in excess of the 10 year government bond rate. We have assessed historical excess returns against our criteria and find this estimation method has significant value.[1112] We are satisfied this is the most robust source of evidence for estimating a 10 year forward looking MRP.[1113] This view is consistent with the Rate of Return guideline (Guideline).[1114] We place most reliance on this source of information in estimating the MRP.

Under current market conditions, we consider historical excess returns produce an MRP estimate of 6.0 per cent from within a range of 5.1 to 6.5 per cent.[1115]

1109 NER, cl 6.5.2(f); NER, cl. 6A.6.2(f); NGR, r. 87(6).

1110 NER, cl 6.5.2(g); NER, cl. 6A.6.2(g); NGR, r. 87(7).

1111 AER, *Rate of return guideline*, 17 December 2013, p. 16.

1112 See steps one and two in section 3.4.1 for our assessment of this information against our criteria.

1113 See steps one and two in section 3.4.1.

1114 AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, p. 78.

1115 In December 2013, we noted that 'while a point estimate of 6.0 per cent is common, the choice of the averaging period and judgements in the compilation of the data result in a range for plausible estimates of the MRP of about 5.0–6.5 per cent'. See AER, *Explanatory statement rate of return guideline,* 17 December 2013, p. 95. In our November 2014 draft decisions for other service providers we updated these estimates to the 2013 calendar year end. For this decision we have updated these estimates to the 2014 calendar year end. Consistent with the worked example in the Guideline, we set the bottom of the range as 20 basis points above the highest estimate from the range of geometric averages. By setting the top of the range at 6.5 per cent, we fully cover the historical excess returns estimates using arithmetic averages (the highest estimate using arithmetic averages is 6.41 per cent).

In the following sections we:

- update the estimates to add data up to the 2014 calendar year end
- consider what sampling period to apply
- consider our use of arithmetic and geometric averages
- consider submissions about the underlying dataset for the period 1883 to 1958.

C.1.1 Updated estimates

Table 3-36 sets out arithmetic and geometric average historical excess returns estimated over different sample periods up until the 2014 calendar year end.[1116] Arithmetic averages range between 5.8 and 6.4 per cent and geometric averages range between 3.9 and 4.9 per cent.

Table 3-36 Historical excess returns based on a theta of 0.6 (per cent)

Sampling period	Arithmetic average	Geometric average
1883–2014	6.2	4.9
1937–2014	5.9	4.0
1958–2014	6.4	4.0
1980–2014	6.3	3.9
1988–2014	5.8	4.1

Source: AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, p. 82; AER updates.

The estimates in Table 3-36 are based on an imputation credit utilisation rate (theta) of 0.6. This is consistent with other parts of this decision (see attachment 4—value of imputation credits).

C.1.2 Sampling period

We consider five sampling periods: 1883–2014, 1937–2014, 1958–2014, 1980–2014 and 1988–2014. Brailsford et al. use these estimation periods, stressing that clearly identifiable and material changes in the underlying data determine these periods. These include:[1117]

1116 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.

1117 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 76–77, 85–86.

- 1883 is the first (calendar) year for which data are available under the Commercial and Industrial price index. However, this did not include a financial sector and suffered from narrow coverage.[1118]
- 1937 is the first year for which data are available on both a broad stock index (the Sydney All Ordinary Shares price index) and on marketable short term government securities. However, Australian government stock price controls were in operation from November 1941 to February 1947. Therefore, some of these observations are not market determined.
- 1958 is the first year for which daily calculations of the Sydney All Ordinary Shares price index were available.
- 1980 is the first year for which daily calculations of the Australian Stock Exchange (ASX) All Ordinaries accumulation index were available.
- 1988 is the first full year of operation of the dividend imputation tax system in Australia.

We have regard to each of these sampling periods because we recognise each of these periods has different strengths and weaknesses. Specifically:[1119]

- Longer time series contain a greater number of observations, so generally produce a more statistically precise estimate.
- Significant increases in the quality of the data become available in 1937, 1958 and 1980.
- More recent sampling periods more closely accord with the current financial environment, particularly since financial deregulation (1980) and the introduction of the imputation credit taxation system (1988).
- Shorter time series are more vulnerable to influence by the current stage of the business cycle and one-off events.[1120]

In its 2015 report for several service providers, NERA Economic Consulting (NERA) submitted that the use of multiple overlapping sampling periods places more weight on more recent data and reduces the statistical precision of the MRP estimates.[1121]

[1118] The Commercial and Industrial price index only included 5 stocks in 1875, 12 in 1905 and 47 in 1945.

[1119] AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 82.

[1120] AER, *Final decision—WACC review*, May 2009, pp. 200, 204; Brailsford, Handley and Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, 2008, vol. 48, pp. 78–82.

[1121] NERA, *Historical estimates of the market risk premium: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, February 2015, p. 42. (NERA, *Historical estimates of the market risk premium*, February 2015). SFG and CEG used the historical excess returns MRP estimates derived by NERA (over the longest period available) in their 2014 and 2015 reports. See: SFG, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon and Transend*, 27 May 2014, p. 54. (SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014); SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 57; SFG, *Updated estimate of the required return on equity: Report for SA*

However, statistical precision is not the only factor we consider in choosing which sampling periods to use. As outlined above, we have regard to all five sampling periods because each has different strengths and weaknesses.

C.1.3 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.[1122] In estimating the MRP, we have regard to both arithmetic and geometric average historical excess returns. This decision is informed by the following considerations:

- We consider the arithmetic average of 10 year historical excess returns would likely be an unbiased estimator of a forward looking 10 year return. However, historical excess returns are estimated as the arithmetic or geometric average of one year returns. Since one year historical excess returns are variable, their arithmetic average will overstate the arithmetic average of 10 year historical excess returns. Similarly, the geometric average of one year historical excess returns will understate the arithmetic average of 10 year historical excess returns.[1123]
- We have previously considered arithmetic and geometric averages relevant when estimating a 10 year forward looking MRP using historical annual excess returns.[1124] The Australian Competition Tribunal (Tribunal) found no error with this approach.[1125]

Power Networks, 8 September 2014, p. 3; SFG, *The required return on equity: Initial review of the AER draft decisions: Report for ActewAGL, Ausgrid, Essential Energy and Endeavour Energy*, 19 January 2015, p. 42 (SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015); SFG, *The required return on equity: Initial review of the AER draft decisions: Report for Energex*, 30 January 2015, p. 42 (this report is very similar to SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, therefore, any references to the 19 January 2015 report in this appendix also apply to the 30 January 2015 report); SFG, *The required return on equity for the benchmark efficient entity: Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, APA, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, 13 February 2015, p. 23 (SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015); SFG, *The required return on equity for the benchmark efficient entity: Ausgrid, Endeavour Energy and Essential Energy*, 12 March 2015, p. 23 (this report is very similar to SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, therefore, any references to the February 2015 report in this appendix also apply to the March 2015 report); CEG, *WACC estimates: A report for NSW DNSPs*, May 2014, p. 27; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 5. NERA also applied its historical excess returns MRP estimate over the longest available period in its report for TransGrid (see: NERA, *Return on capital of a regulated electricity network*, May 2014, p. 80).

1122 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.

1123 For an additional example, see AER, *Draft decision: SPI Networks access arrangement*, September 2012, Appendix B.2.1.

1124 For example, see AER, *Final decision: SPI Networks (Gas) access arrangemen*t, March 2013, Part 3, B.5.1.

1125 Australian Competition Tribunal, *Application by Envestra Ltd (No 2) [2012] ACompT4*, 11 January 2012, paragraph 157.

- 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.[1126] While we do not adopt this approach, this indicates that experts and other regulators consider geometric averages valuable.
- McKenzie and Partington advised that 'the unbiased estimator of the MRP lies between the arithmetic average and the geometric average'.[1127]
- While we acknowledge geometric averages may exhibit downwards bias, we also note that arithmetic averages may exhibit upwards bias. This is because:[1128]

> As Blume (1974) shows, when compounding the arithmetic average over time, it is the sampling error in the measurement of the arithmetic average return that causes the upward bias in the expected return. If we assume, as in the teaching note for the Harvard case study, that there is no sampling error in the measurement of arithmetic returns then there is no bias. There would also be no bias if the sample of returns was of infinite size. The reality is that we have a finite sample of returns and we do have sampling error. The consequence, as Blume clearly shows, is upward bias when the arithmetic average is compounded over more than one period. It is also well understood that the geometric average normally gives a downward biased measurement of expected returns.

These views are consistent with our November 2014 draft decisions. We did not agree with SFG Consulting's (SFG's) recommendation that arithmetic average historical excess returns should be used in estimating the MRP, and geometric averages should not be used.[1129] In its August 2014 and January 2015 reports for several service providers, SFG has reiterated this recommendation.[1130] However, it has not provided any new analysis to support its view. Therefore, SFG has not convinced us to accept its recommendation. In turn, we continue to disagree with SFG on this issue.

In its 2015 report, NERA also recommended we give no weight to geometric average historical excess returns.[1131] It submitted that an estimate of the MRP based solely on arithmetic averages of historical excess returns will result in a materially better estimate than an estimate based (solely or in part) on geometric averages of historical excess returns. NERA based this submission on the following reasoning:[1132]

1126 Wright and Smithers, *The cost of equity capital for regulated companies: A review of Ofgem*, 2014, p. 9.

1127 McKenzie and Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, p. 5.

1128 McKenzie and Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, p. 6.

1129 SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, p. 49.

1130 SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 28; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015.

1131 NERA, *Historical estimates of the market risk premium*, February 2015, p. 12. In its 2014 and 2015 reports, CEG (and NERA, in its 2014 report for TransGrid) also relied on arithmetic averages because it used the historical excess returns MRP estimates derived by NERA (see footnote 1121).

1132 NERA, *Historical estimates of the market risk premium*, February 2015, p. 12.

- If geometric average historical excess returns are used to estimate the MRP, the estimate of the weighted average cost of capital (WACC) will be biased downward in any one year.
- If arithmetic average historical excess returns are used to estimate the MRP, the estimate of the WACC will only be biased upward if it is compounded over more than one year.
- The AER, aside from some minor adjustments to the RAB and to the evolution of prices over the regulatory period, does not compound the WACC over more than one year. Therefore, using arithmetic average historical excess returns to estimate the MRP results in an unbiased WACC estimate (all else equal).

We maintain our view that it is reasonable to have regard to both arithmetic and geometric average historical excess returns in estimating the MRP.

We explained why we disagreed with NERA's view in the 2012 decision for the Roma to Brisbane pipeline and the 2013 decisions for the Victorian gas network businesses, and we are satisfied this material remains relevant.[1133] However, given the submissions received, we have reviewed the material before us.

We consider the building block model is a tool to achieve an outcome whereby the present value of expected revenue equals the present value of expected expenditure over the life of the regulated assets. From this perspective, we consider an appropriate discount rate requires the evaluation of an expected multi-period return on equity.[1134] Even if we do not compound the WACC in our building block model, we are still estimating a multi-period return on equity and the expected 10 year MRP. Moreover, NERA may have made simplifying assumptions in coming to its view. For example, NERA may be assuming that all cash flows are paid out rather than invested at the end of each period and that there is no capital expenditure at the end of the first period. These simplifying assumptions may not be consistent with reality.

Further, as shown in Table 3-36, the arithmetic averages of historical excess returns range from 5.8 to 6.4 per cent, and the most recent estimate is 5.8 per cent. Accordingly, even if we were to rely on the arithmetic averages (and place no weight on the geometric averages), they do not support NERA's proposed MRP estimate of 6.56 per cent.[1135]

We note consultants and stakeholders have expressed different views. For example:

[1133] 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, A*ccess 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.

[1134] Our consideration was discussed in detail in AER, A*ccess arrangement draft decision: Roma to Brisbane Pipeline 2012–13 to 2016–17*, April 2012, pp. 295–296.

[1135] NERA, *Historical estimates of the market risk premium*, February 2015, p. 42.

- McKenzie and Partington supported our view in their 2012 report. We sought their advice on whether there is a method to produce an unbiased MRP estimate using historical excess returns. They analysed alternative proposals in the literature and concluded that, as at February 2012, no single best estimator is indisputably best for long run historical excess returns.[1136] McKenzie and Partington recommended the use of both arithmetic averages and geometric averages, tempered by an understanding of their inherent biases.
- Lally recommended using arithmetic averages in his 2012 report. He considered 'the absence of a compounding effect leads to a preference for the arithmetic mean over the geometric mean'.[1137]
- The South Australian Council of Social Service (SACOSS) considered geometric averages 'should not be dismissed'.[1138] Its consultant, the SA Centre for Economic Studies (SACES), submitted that arithmetic averages are only superior to geometric averages if annual returns on the stock market represent an independent and identically distributed process, which is not the case for equities which exhibit strong year to year negative serial correlation in returns.[1139] It also noted that some authorities in the field regard geometric averages as a better measure of the MRP.[1140]

In view of the conflicting evidence, we consider regard should be had to both arithmetic and geometric averages when considering the historical excess returns estimates of the MRP. We are aware of potential deficiencies with both averages, so we do not exclusively rely on one or the other.

C.1.4 Historical data

To date, we have used historical excess returns estimated by Brailsford, Handley and Maheswaran (Brailsford et al.) and updated from time to time by Handley.[1141] Brailsford et al. produced a comprehensive study that a peer reviewed academic journal published. This study found that, 'estimates based on data before 1958 should be treated with caution because of concerns over data quality and the imprecision of the

1136 McKenzie and Partington, *Supplementary report on the MRP*, February 2012, pp. 7–9.

1137 Lally, *The cost of equity and the market risk premium*, 25 July 2012, p. 31.

1138 SACOSS, *Submission to SA Power Networks regulatory proposal for 2015–20*, January 2015, p. 20.

1139 This weighting scheme gives the geometric mean a weight equal to the ratio of the investment horizon and the time period over which the average has been calculated. SACES, *Independent estimate of the weighted average cost of capital (WACC) for SA Power Networks 2015 to 2020: Report commissioned for the South Australian Council of Social Services*, January 2015, p. 9. (SACES, *Independent estimate of the WACC*, January 2015)

1140 SACES referenced Dimson et al (2011) as an example. SACES, *Independent estimate of the WACC*, January 2015, pp. 8–9.

1141 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).

underlying series'.[1142] This finding, in part, informs our position to consider different sampling periods.

In their study, Brailsford et al. extensively considered issues concerning early data. Specifically:[1143]

- Lamberton and the Sydney Stock Exchange (SSE) retrospectively constructed earlier yields for the period 1882 to 1955 and 1956 to 1961 respectively. These series represent the simple, unweighted average yield on dividend paying shares only. Unweighted yields are biased towards high yielding small stocks, compared to the value weighted yield. Further, excluding non-dividend paying shares will also overstate the yield.
- Brailsford et al. confirmed with the ASX that, due to the upwards bias in early data, the ASX made an adjustment. Specifically, the ASX stated:[1144]

> It was concluded that the real weighted dividend yield was probably overstated about a third on average and therefore the [Lamberton/SSE yield] series was reduced by 25% in the early years of the accumulation index where we didn't have any other dividend yields to guide us.

- Further investigations by Brailsford et al. confirmed the ASX applied an adjustment factor of 0.75 for the period 1882 to 1964.
- Brailsford et al. investigated whether the adjustment applied by the ASX was reasonable. They confirmed the adjustment was reasonable and concluded:[1145]

> It appears that an adjustment factor somewhere in the range of 0.65–0.75 would be defensible. We cannot be more specific, but note that there is no strong evidence to suggest that we should diverge from the currently used adjustment factor. Nonetheless, what this issue reveals is that these data and the equity premium obtained thereof should be treated with caution.

During the Guideline development process, the Energy Networks Association (ENA) engaged NERA, which proposed an alternative adjustment to the Lamberton dataset.[1146] In the November 2014 draft decisions we considered NERA's adjustment

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[1142] Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 75.

[1143] Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 79–81.

[1144] 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.

[1145] Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 81.

[1146] 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: A report for the Energy Networks Association*, June 2013. (NERA, *The market size and value premiums*, June 2013). This alternative adjustment was supported by SFG in its 2014 report was not warranted and did not lead to a material improvement in the quality of our data. In its 2015 report, NERA has again proposed its alternative adjustment to the Lamberton dataset.[1147]

In this decision, we maintain our position from the November 2014 draft decisions. We do not consider NERA's adjustment warranted, nor does it lead to a material improvement in the quality of our data. The ASX, which we consider to be a credible source, provided and adjusted the earlier data. Further, Brailsford et al. reviewed the ASX's adjustment in a comprehensive study, which a peer reviewed academic journal published.[1148] Brailsford et al. found, 'an adjustment factor somewhere in the range of 0.65–0.75 would be defensible'.[1149]

In the November 2014 draft decisions, we outlined several concerns with NERA's analysis:

- NERA noted that while its yields are 'strongly correlated' with Lamberton's, the two datasets do not reconcile completely.[1150] For this reason, it seems likely that NERA has different data to Lamberton. If this is the case, we are not satisfied that any adjustment to the Lamberton series based on NERA's findings would be appropriate. The difference in NERA's data could make a significant difference in terms of NERA's proposed adjustment. Handley observed: [1151]

  > a necessary first step in arguing there is a problem with the ASX adjustment (and by implication a problem with the BHM historic returns dataset) is to precisely reconcile their estimates with those of Lamberton. NERA have failed to do this.

- NERA used annual data, whereas Lamberton used quarterly data.[1152]
- NERA submitted a fine detail about accuracy, which we consider unachievable. NERA chose seven data points out of the 300 quarters available during the Lamberton data period.[1153] Further, NERA's estimated adjustment is only smaller

for several service providers (see: SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, pp. 49–52).

[1147] NERA, *Historical estimates of the market risk premium*, February 2015, pp. i–vii. SFG has also reiterated its support for NERA's alternative adjustment in its August 2014 and February 2015 reports for several service providers (see: SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 28–31; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 23). In its 2014 and 2015 reports, CEG (and NERA, in its 2014 report for TransGrid) also used NERA's adjustment because it used the historical excess returns MRP estimates derived by NERA (see footnote 1121).

[1148] Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008.

[1149] Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 81.

[1150] NERA, *The market, size and value premiums*, June 2013, p. 11.

[1151] Handley, *Advice on the return on equity*, 16 October 2014, p. 20.

[1152] NERA, *The market, size and value premiums*, June 2013, pp. 7–8.

[1153] NERA, *The market, size and value premiums*, June 2013, p. 11.

than the ASX adjustment for four of their data points.[1154] For this type of analysis to be effective, we consider there needs to be certainty that the calculated adjustment factors are correct. We consider such certainty unrealistic, particularly because estimates in the Lamberton data period are subject to many limitations.[1155]

NERA, in its 2015 report, responded to these concerns. It submitted:

- NERA considered its estimated adjustment is more accurate than the ASX's adjustment.[1156]
- Neither NERA nor Brailsford et al. use the original price series that Lamberton assembled. NERA submitted that in general it uses the same sources as Lamberton employs.[1157]
- NERA considered our statement that 'NERA used annual data, whereas Lamberton used quarterly data'[1158] is incorrect.[1159]

We have considered NERA's views and maintain our position from the November 2014 draft decisions for this decision. We maintain our reasoning as outlined above, and add the following:

- NERA's first point is based on correspondence from an ASX employee to Brailsford et al. about the ASX's adjustment and NERA's use of seven data points, which increases the statistical precision of its estimates. We are not satisfied the correspondence from an ASX employee to Brailsford et al. provides sufficient evidence to conclude the ASX's adjustment is inappropriate.
- In his 2015 report, Handley responds to NERA's submissions and reiterated that NERA has not reconciled their data back to the Lamberton data. He showed that NERA's estimates generally do not agree with Lamberton's, and states that:[1160]

  > This means that any observed difference between the NERA adjustment factor and the ASX adjustment factor (for any particular data point) could simply be attributable to the difference between the NERA and Lamberton data sets – rather than indicating that the ASX adjustment factor is in error (as NERA has suggests).

- In his 2015 report, Handley concluded that NERA has not established there is a downward bias in the Brailsford et al. data set.[1161]

[1154] NERA, *The market, size and value premiums*, June 2013, table 2.2; Handley, *Advice on the return on equity*, 16 October 2014, p. 19.

[1155] Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008.

[1156] NERA, *Historical estimates of the market risk premium*, February 2015, pp. 30–31. NERA also noted that five, rather than four, of the adjustment factors that it computes exceed the adjustment factor that Brailsford et al. use.

[1157] NERA, *Historical estimates of the market risk premium*, February 2015, pp. 32, 39.

[1158] AER, *Draft decision: ActewAGL distribution determination 2015–16 to 2018–19—Attachment 3: Rate of return*, November 2014, p. 3-199.

[1159] NERA, *Historical estimates of the market risk premium*, February 2015, p. 39.

[1160] Handley, *Further advice on the return on equity equity,* April 2015, pp. 8–9.

Further, using NERA's adjustment to earlier data does not change the estimate of the MRP based on historical excess returns. This is because:[1162]

- When estimating an MRP from historical excess returns, we have regard to a number of different time periods and averaging methods. Table 3-37 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.
- As discussed above, Brailsford et al. outline a number of general reasons why we should be careful when interpreting pre-1936 data.[1163] In fact, Brailsford et al. specified, 'estimates based on data before 1958 should be treated with caution because of concerns over data quality and the imprecision of the underlying series'.[1164] These concerns remain regardless of which adjustment is used.
- Concerns regarding the possible causes of upward bias in MRP estimates from historical excess returns are still applicable. This includes survivorship bias. This is when historical data overstates MRP estimates relative to true expectations because historical returns are only estimated on stocks that have survived.[1165] This upward bias is important because various Australian stock indexes exclude failed stocks.[1166]

Table 3-37 Historical excess returns using NERA's adjustment to earlier data, 0.6 theta (per cent)

Sampling period	Arithmetic average (without NERA adjustment)	Arithmetic average (with NERA adjustment)
1883–2014	6.2	6.6
1937–2014	5.9	5.9
1958–2014	6.4	6.4
1980–2014	6.3	6.3

1161 Handley, *Further advice on the return on equity*, April 2015, p. 9.

1162 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 83–84.

1163 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 79–81.

1164 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 75.

1165 Damodoran, A., *Equity risk premiums: determinants, estimation and implications—the 2012 edition*, Mach 2012, p. 24; McKenzie and Partington, *Equity market risk premium*, December 2011, pp. 6–8; McKenzie and Partington, *MRP: regime switching framework and survey evidence*, August 2012, p. 19; Joye, C., *Super funds miss mark in bias to equities*, Australian Financial Review, 14 August 2012.

1166 For example, the ASX All Ordinaries Index represents the 500 largest companies listed on the ASX. Market capitalisation is the only eligibility requirement. An underperforming stock that is losing its market share would be eventually be removed from the index. See: http://www.asx.com.au/products/capitalisation-indices.htm#all_ordinaries_index.

Sampling period	Arithmetic average (without NERA adjustment)	Arithmetic average (with NERA adjustment)
1988–2014	5.8	5.8

Source: AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, p. 83; AER updates

C.2 Dividend growth models

We can use DGMs to derive the return on equity.[1167] DGMs derive the return on equity in a way that makes the forecast dividends for a business consistent with the market value of its equity.[1168] There are many ways to construct a DGM. We derive an estimate and range using our preferred construction of the DGM. The following equation depicts the DGM, which estimates *k*, the expected return on equity for the market portfolio:

$$P_c = \frac{m \times E(D_c)}{(1+k)^{m/2}} + \sum_{t=1}^{N} \frac{E(D_t)}{(1+k)^{m+t-0.5}} + \frac{\frac{E(D_N)(1+g)}{k-g}}{(1+k)^{m+N-0.5}}$$

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[1169]

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

k is the discount rate-that is, the return on equity.

Appendix B–DGM sets out detailed reasons for our preferred construction of the DGM. This construction is consistent with that set out in our Guideline.[1170]

Our preferred construction of the DGM produces an estimate of the MRP within the range of 7.4 to 8.6 per cent for the two months ending February 2015. Table 3-38

1167 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.

1168 This is consistent with the finance principle that equilibrium stock prices are the present value of a stream of dividends. See Brigham, E.F., Daves, P.R. 2010, 'Intermediate Financial Management', Ed. 10, South-Western Cengage Learning, p. 161

1169 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.

1170 For more information on our preferred DGM construction, see: AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 114–125. 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.

shows how we construct this range from DGM estimates under different assumptions.[1171]

Table 3-38 MRP estimates under dividend growth models, 0.6 theta (per cent)

Growth rate [a]	Two stage model	Three stage model
4.0	7.4	7.8
4.6	8.0	8.2
5.1	8.4	8.6

Source: Bloomberg, AER analysis.

a) See section B.2.1 of appendix B–DGM for discussion on these long term dividend growth rate estimates. These estimates are based on Lally's analysis, which applies deductions of 0.5, 1.0 and 1.5 per cent to the long term expected growth rate of real GDP of 3 per cent. See: Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013.

The DGM range is formed using a number of assumptions. We have conducted a sensitivity analysis in our appendix on the DGM (see section B.5). This shows that, like all DGM analyses, estimates vary considerably when we alter assumptions within a reasonable range. This is one of a number of limitations associated with practically implementing DGMs, and these are discussed in detail in appendix A–equity models, appendix B–DGM and under step two in section 3.4.1 of this attachment.

C.2.1 Reasons for our dividend growth model

Several service providers have proposed applying an alternative version of the DGM, which we have regard to (see appendix B–DGM).[1172] However, we consider our DGM construction preferable for estimating the MRP in the regulatory context. This is for the following reasons:

- When developing the Guideline, we developed our preferred construction of the DGM in close consultation with stakeholders. Following this, we engaged experts

1171 The range of the DGM estimates reflects our two and three stage DGMs and the range of Lally's estimates of the growth in real dividends per share. He suggests a range of 1.5 per cent, 2.0 per cent and 2.5 per cent. These estimates correspond to estimates of g, the growth in nominal dividends per share, of 4.0 per cent, 4.6 per cent and 5.1 per cent. See: Lally, *The Dividend Growth Model*, 4 March, 2013

1172 JGN, ActewAGL, the NSW DNSPs, TransGrid, SA Power Networks and the Qld DNSPs submitted we consider SFG's DGM (as part of multiple model approaches to determine either the return on equity or the equity beta for use in the SLCAPM). SFG's DGM is set out in: SFG, *Alternative versions of the dividend discount model and the implied cost of equity: Report for Jemena Gas Networks, ActewAGL, APA, Ergon, Networks NSW, Transend and TransGrid*, 15 May 2014 (SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014); and SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013. SFG again proposed its DGM construction in its 2015 report: SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, section 5.

to critically review our construction of the DGM.[1173] We consider their advice suggested that, overall, our construction of the DGM is reasonable.[1174]

- We have considered various submissions on our construction of the DGM during the Guideline development process and as a part of the recent regulatory proposals and revised proposals.[1175] These submissions have not satisfied us that there are good reasons to depart from our construction of the DGM, which we consider to be more suitable for regulatory purposes (see appendix B–DGM).
- We consider our estimated long term growth rate of nominal dividends per share of 4.6 per cent to be reasonable, if not 'somewhat on the generous side'.[1176] We base this estimate on expert advice by Lally.[1177] See section B.2.1 of appendix B–DGM for how Lally produces this estimate.

Further, we have assessed SFG's and our construction of the DGM against our criteria (see section B.2.7 of appendix B–DGM). This analysis explains why we are satisfied our construction of the DGM is more robust than SFG's construction.

C.3 Survey evidence

Survey estimates explore investor expectations about the MRP. 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 MRP. Our assessment of survey evidence against our criteria informs our use of this information.[1178]

Table 3-39 sets out key findings from market surveys published since 2013. Estimates from these surveys cluster around 6.0 per cent. We have not found any new surveys since the publication of the November 2014 draft decisions.

1173 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.

1174 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.

1175 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: Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL Electricity, APA, Ausgrid, AusNet Services, CitiPower, Endeavour, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, 13 February 2015 (SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015).

1176 McKenzie and Partington, *The DGM*, December 2013, p. 15. McKenzie and Partington find the average of the long term dividend growth rate estimates they consider is 3.73 per cent (3.78 per cent excluding the most extreme values).

1177 Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, p. 14.

1178 For our assessment, see steps one and two in section 3.4.1 of this attachment.

Table 3-39 Key findings from recent MRP surveys

Survey	Numbers of responses	Mean (%)	Median (%)	Mode (%)
Fernandez et al (2013)	73	5.9	6.0	N/A
KPMG (2013)[b]	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)	93[a]	5.9	6.0	N/A

Sources: 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.

Notes: a) The 2014 survey did not report the response rate. AER staff obtained this information from Professor Fernandez via email correspondence on 22 July 2014.

b) While this survey had 23 market participants, 19 specified what MRP they used.

We recognise the Tribunal has in the past made comments on several factors that should be considered when using survey evidence to estimate the MRP.[1179] It stated:[1180]

> Consideration must be given at least to the types of questions asked, the wording of those questions, the sample of respondents, the number of respondents, the number of non-respondents and the timing of the survey. Problems in any of these can lead to the survey results being largely valueless or potentially inaccurate.

We apply the Tribunal's criteria to the survey evidence we consider. We note that triangulation across surveys can reduce the limitations associated with particular survey evidence.[1181] We consider the surveys we rely on are reasonably consistent with the Tribunal's criteria for the following reasons:

1179 In its 2014 and 2015 reports, SFG has raised this as a reason for why we should not place any reliance on MRP estimates from survey evidence. 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*, 13 February 2015, p. 26.

1180 Australian Competition Tribunal, *Application by Envestra Limited (No 2) [2012] ACompT 3*, 11 January 2012, paragraphs 165–166.

1181 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.

- Timing of the survey—we consider the timing of each survey is clear in all but one survey we consider, and the earliest survey we consider was published in January 2013 but sent out its questionnaires in May and June 2012.[1182]
- Sample of respondents—financial managers and analysts, expert valuers, actuaries, finance academics, investment banks, professional services firms and infrastructure funds were the target respondents of surveys. These professionals apply the MRP, so we consider the surveys' target populations can make informed judgments about the MRP. Each survey also sets out the selection of the sample surveyed (or respondents).[1183]
- 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.[1184] All but one survey we consider has been repeated at least three times.[1185]
- 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.[1186] Three of the surveys we consider have over 30 respondents (see Table 3-39).[1187]

We also note, while one could consider independent valuation reports a type of survey evidence, we do not use this information to inform our estimate of the MRP. Rather, we use this information to inform the overall return on equity.[1188] In its 2014 reports for several service providers, SFG submitted that we used this information to inform our

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[1182] The KPMG valuation practices survey does not clearly state the time period over which the survey was made. Fernandez, Linares, Acín, *Market Risk Premium used in 88 countries in 2014*, IESE Business School, June 2014, p. 2; Asher and Hickling, *Equity Risk Premium Survey*, Actuary Australia, December 2013, p. 26; Fernandez, Arguirreamalloa and Linares, *Market Risk Premium and Risk Free Rate used for 51 countries in 2013*, IESE Business School, June 2013, p. 2; Fernandez, Arguirreamalloa and Corres, *Market Risk Premium used in 82 Countries in 2012*, IESE Business School, January 2013, p. 2.

[1183] Fernandez, Linares, Acín, *Market Risk Premium used in 88 countries in 2014*, IESE Business School, June 2014, p. 2; Asher and Hickling, *Equity Risk Premium Survey*, Actuary Australia, December 2013, p. 26; Fernandez, Arguirreamalloa and Linares, *Market Risk Premium and Risk Free Rate used for 51 countries in 2013*, IESE Business School, June 2013, p. 2; KPMG, *Valuation Practices Survey 2013*, February 2013, p. 2; Fernandez, Arguirreamalloa and Corres, *Market Risk Premium used in 82 Countries in 2012*, IESE Business School, January 2013, p. 2.

[1184] 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, p. 32.

[1185] We consider three Fernandez et al. surveys in our sample (and more have been published prior to 2013). The 2013 Asher and Hickling survey is the third year for which they had done the survey (see: Asher and Hickling, *Equity Risk Premium Survey*, Actuary Australia, December 2013, p. 26).

[1186] McKenzie and Partington, *Supplementary report on the MRP*, February 2012, pp. 17–18.

[1187] See 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, pp. 33–34 for more information on Graham and Harvey's findings on sample representiveness and non-response bias.

[1188] See steps one and two of this attachment.

MRP in the Guideline.[1189] SFG based this on the reliance we gave to the surveys, Ernst & Young (2012) and KPMG (2013).[1190] In this decision, we only consider MRP survey evidence from 2013. Further, we note that KPMG (2013) is not an independent valuation report, nor does it summarise independent valuation reports. Rather, it is a survey of methodologies adopted by Australian financial analysts and corporate financiers.[1191]

In its 2015 report, SFG submitted that survey evidence does not provide relevant evidence for estimating the MRP because the evidence suggests market participants are simply regurgitating historical excess returns.[1192] We do not agree with SFG's view. We are estimating the expected MRP. We consider survey estimates reflect investors' expectations of the MRP. What evidence investors use to form their expectations is their choice and, in our view, does not deem these estimates irrelevant.

C.4 Conditioning variables

Conditioning variables are variables that can be used to make adjustments to the average historical excess return, or in other words, condition it. We consider three types of conditioning variables: dividend yields, credit spreads and implied volatility.

We do not consider conditioning variables provide reliable estimates of the MRP on their own. However, this information is relevant and may be useful for indicating changes in general market conditions.[1193] This can be valuable in complying with the NER and NGR requirement to have regard to the prevailing conditions in the market for equity funds.[1194] Our assessment of conditioning variables against our criteria informs this position.[1195] From this assessment, we found there are some important limitations to this source of evidence. However, we also found this information valuable for detecting changes in market conditions.

Further, considering conditioning variables symmetrically through time will avoid bias in regulatory outcomes. This is important because, 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 MRP should be significantly above the long term average, service providers relied upon this evidence.[1196] Recently, when implied volatility estimates

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1189 SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, p. 74; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 50.

1190 Ernst & Young, *Market evidence on the cost of equity*, 8 November 2012; KPMG, *Valuation Practices Survey 2013*, February 2013.

1191 KPMG, *Valuation Practices Survey 2013*, February 2013, p. 1.

1192 SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 26.

1193 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 93–100.

1194 NER cll. 6.5.2(g), 6A.6.2(g); NGR r. 87(7).

1195 See steps one and two in section 3.4.1 of this attachment.

1196 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.

have fallen, service providers have not proposed we consider this evidence.[1197] Similarly, service providers and their consultants have proposed dividend yields and credit spreads as useful indicators for the MRP when these supported higher estimates.[1198] Generally, they have not done so for this decision, when dividend yields and credit spreads are lower.[1199]

For the reasons set out below, we consider that, overall, the conditioning variables appear fairly stable and 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 (GFC) and European debt crisis. Therefore, we consider the conditioning variables do not support a change in the MRP above or below that implied by its long term average.

In its 2015 report, SFG submitted that if conditioning variables are to be used in estimating the MRP, the risk free rate should be included among them.[1200] We do not agree with this submission. This is because the evidence before us is insufficient to satisfy us that there is a clear relationship between the 10 year forward looking risk free rate and MRP (see section C.7). Moreover, we have regard to the possibility of an inverse relationship between the risk free rate and MRP when we consider the Wright approach at the overall return on equity level (steps four and five of our foundation model approach).

C.4.1 Dividend yields

We use dividend yields as a directional indicator of the MRP.[1201] We consider this information by comparing current dividend yields with the average dividend yield through time.[1202] Figure 3-19 shows dividend yields against their historical average.

Figure 3-19 shows, as at 6 March 2015, dividend yields are close to their long term average. These have been relatively steady over the last 12 to 18 months.

[1197] We note that 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. In its 2015 report, SFG makes reference to conditioning variables in response to our November 2014 draft decisions. It submitted that if conditioning variables are to be used, the risk free rate should be included among them (see: SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, pp. 26–27).

[1198] For example, CEG, *Update to March 2012 Report: On consistency of the risk free rate and MRP in the CAPM*, November 2012, pp. 11–16; SFG, *Market risk premium: Report for APT Petroleum Pipelines Ltd*, October 2011, pp. 11–14.

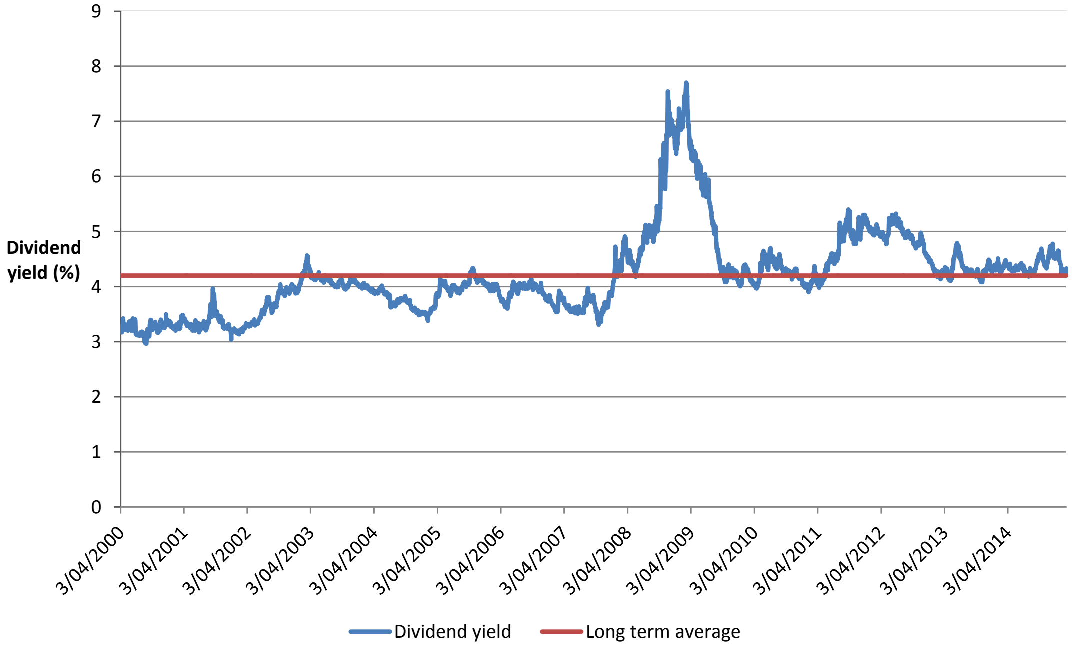
[1199] The exception to this is CEG. In its 2015 report, CEG submitted that dividend yields have not fallen post-GFC, which is evidence that the MRP has not fallen as the risk free rate has fallen (see: CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 26–27). Also, SFG makes reference to conditioning variables in response to our November 2014 draft decisions. It submitted that if conditioning variables are to be used, the risk free rate should be included among them (see: SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, pp. 26–27).

[1200] SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 27.

[1201] AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 94.

[1202] For a similar approach, see SFG, *Market risk premium: Report for APT Petroleum Pipelines Ltd*, October 2011, p. 13.

Figure 3-19 Dividend yields



Source: Bloomberg, AER analysis.

In its 2015 report for several service providers, the Competition Economists Group (CEG) submitted that dividend yields have risen relative to pre-GFC levels. CEG stated this implies 'the MRP measured relative to Commonwealth government securities (CGS) has risen by more than offsetting amount than the fall in CGS'.[1203] We do not agree with this submission. Figure 3-19 shows dividend yields up to 6 March 2015. This figure shows that even though dividend yields appear slightly higher than their pre-2007 levels, they are very close to their long term average and have been for the last 12 to 18 months. They do not appear to have increased as CGS yields have decreased..

C.4.2 Credit spreads

Credit spreads are the spreads between the risk free rate and the return on debt for different debt instruments. We use credit spreads as a directional indicator of the MRP.[1204] We consider this information can be used to indicate changes in market conditions. That is, to indicate whether spreads are widening, stabilising or falling.

Figure 3-20 shows credit spreads for a range of debt instruments over yields on CGS. The RBA publishes this graph monthly. These credit spreads were showing a clear downward trend since approximately 2012, and now appear to be widening slightly (as at February 2015). Most credit spreads are also above their pre-2007 levels, while the

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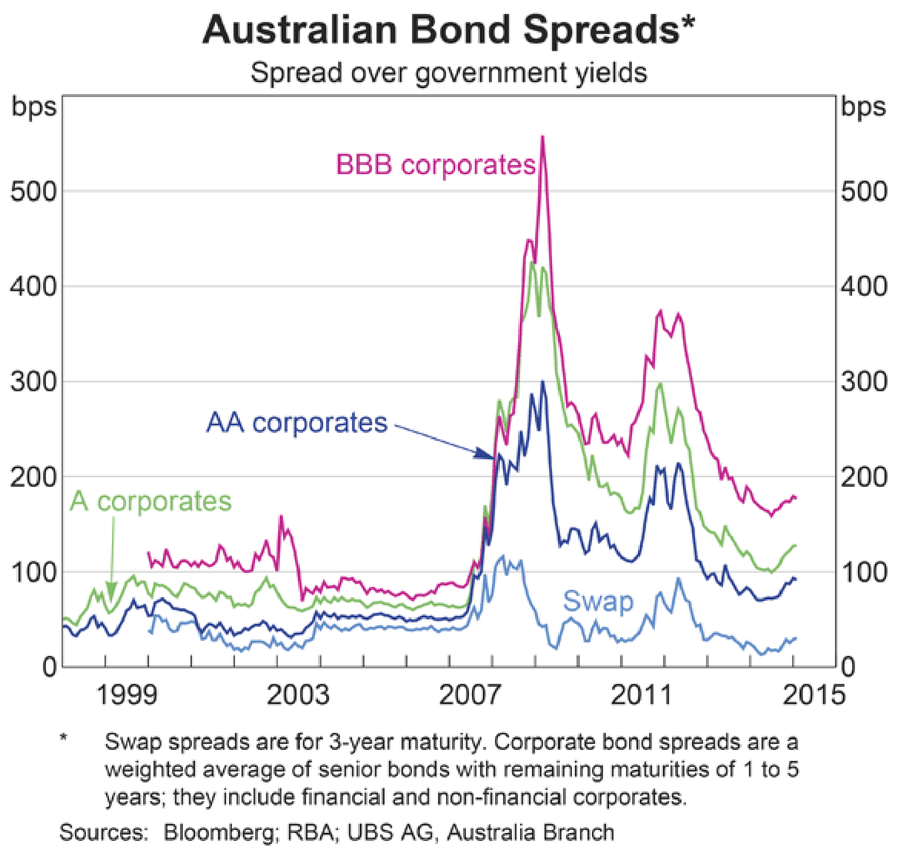
[1203] CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 26–27

[1204] AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 96.

swap rate spread is at or below its pre-2007 levels. In essence, lower quality debt is further from pre-2007 levels than higher quality debt. However, the credit spreads are all substantially lower than they were between 2008 and 2013.

Figure 3-20 Australian bond spreads over government yields

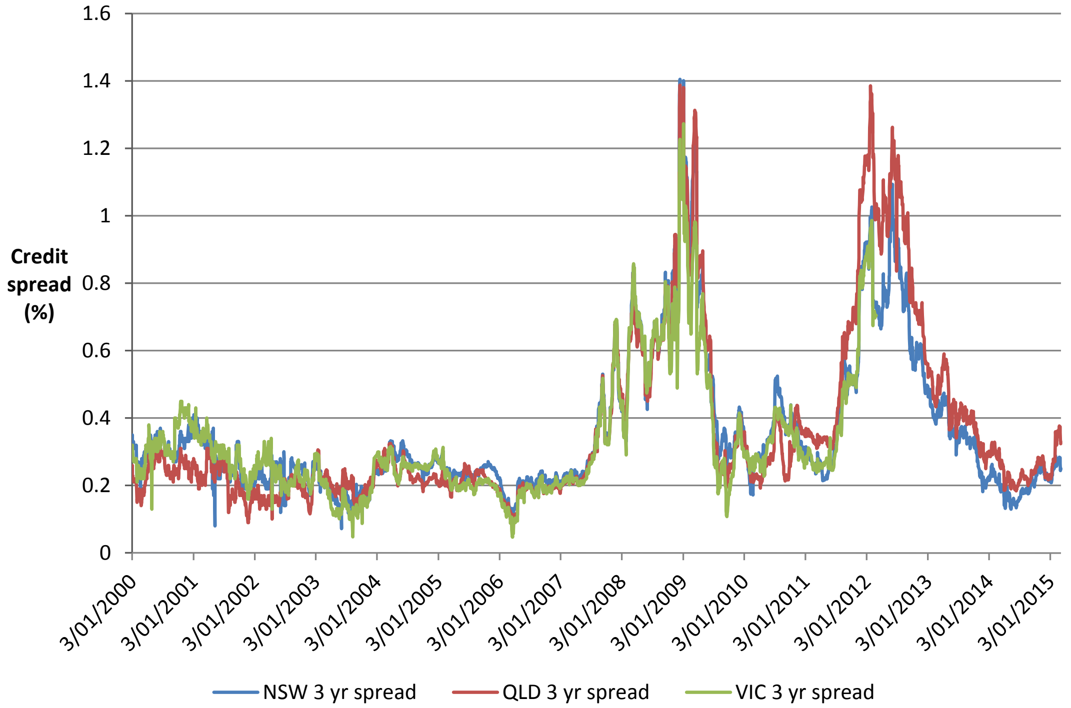


Source: RBA, Chart Pack, 4 March 2015.

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 3-21 shows the spread between state government debt and CGS. This uses maturities of three years as more data are available. Figure 3-21 shows that credit spreads were falling since late 2012, and now appear to be widening slightly (as at 6 March 2015). However, it is not clear whether this increase is evidence of general movement in credit spreads, similar to the pre-2007 movement in the series, or whether it is part of a more pronounced increase away from pre-2007 levels. Regardless, the credit spreads remain close to their pre-2007 levels.

Figure 3-21 State government bond spreads over government yields



Source: RBA, AER analysis.

C.4.3 Implied volatility

The implied volatility approach is based on an assumption that the MRP is the price of risk multiplied by the volume of risk (volatility).[1205] In the past, Value Adviser Associates (VAA) submitted on behalf of a service provider that we apply an implied volatility 'glide path' to 10 years.[1206] This is because implied volatility generates an MRP estimate that has the same horizon as the underlying options. In the Guideline, we considered a 'glide path' to extend the estimate to a horizon of 10 years.[1207] However, the Guideline also specified we would only use this information as a directional indicator. As such, we do not use a point estimate from implied volatility to inform our MRP estimate.

Implied volatility was high during the global financial crisis (GFC) and the height of the European debt crisis. However, recent implied volatility levels have been below the long run average of 18.2 per cent (measured from the start of the data series in 1997). On 6 March 2015, the ASX200 implied volatility index (VIX) was 13.6 per cent. Using

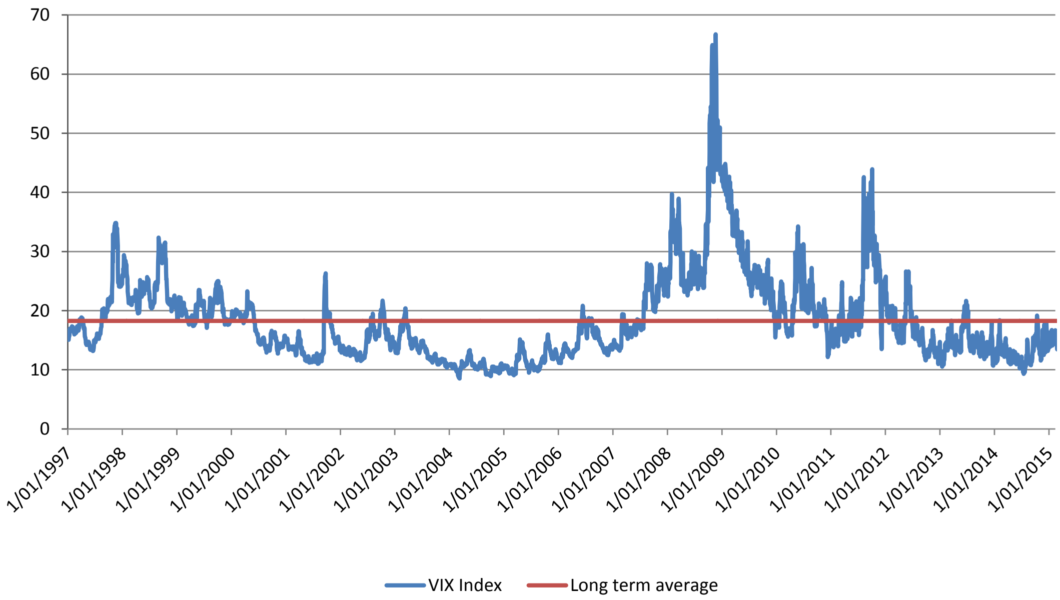
1205 This was based on Merton, R.C., 'On Estimating the Expected Return on the Market: An Exploratory Investigation', *Journal of Financial Economics*, 1980, Vol. 8, pp. 323–361.

1206 We have corrected for some errors in VAA's approach. See AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 98–99. For VAA's approach, see VAA, *MRP for Envestra*, March 2011.

1207 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 98–99.

the same averaging period as the risk free rate, the ASX200 VIX was 14.9 per cent.[1208] Over the year ending 6 March 2015, the ASX200 VIX was 13.2 per cent. Figure 3-22 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. We consider this evidence suggests the MRP is currently below its historical average level.

Figure 3-22 Implied volatility (VIX) over time



Source: ASX200 VIX volatility index, sourced via Bloomberg cost AS51VIX.

C.5 Recent decisions by Australian regulators

In the Guideline, we proposed to review the MRPs in recent Australian regulatory decisions at the time of each decision.[1209] This provides a comparison of what other regulators consider to be a reasonable estimate of the MRP. This information provides a check on how we are considering information before us.

Table 3-40 sets out the MRPs adopted by other Australian regulators responsible for economic regulation across the electricity, water and rail industries.[1210] These estimates range from:

- 5.5 to 7.9 per cent using point estimates chosen by the regulator, or mid points where only a range is presented.
- 5.0 to 8.7 per cent using ranges. That is, the ranges in which the MRP could potentially fall within.[1211]

[1208] This averaging period is 9 February to 6 March 2015.

[1209] AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, pp. 100–102.

[1210] We have updated this table since the November 2014 draft decisions.

Table 3-40 Recent regulatory decisions

Regulator	Decision date	Sector	MRP (%)
ESCV	February 2015	Water	6.0
IPART	February 2015	General/policy	7.2 (mid-point), using 6.0 (10 year), 8.3 (40 day end 31 January 2015)
QCA	February 2015	Water	6.5
TER	January 2015	Water	6.0
ERA	November 2014	Rail	7.9
ERA	October 2014	Rail	6.0
ERA	October 2014	Gas	5.5
QCA	September 2014	Water	6.5
QCA	September 2014	Rail	6.5
QCA	August 2014	General/policy	6.5
IPART	July 2014	Rail	Mid-point WACC, using 5.5–6.5 (long-term), 7.6–8.7 (current market data)
NTUC	April 2014	Electricity	6.0
IPART	June 2014	Water	Mid-point WACC, using 5.5–6.5 (10 year), 7.2–8.6 (40 day end 12 May 2014)
ERA	July 2013	Rail	6.0
ESCV	June 2013	Water	6.0
IPART	June 2013	Water	Mid-point WACC, using 5.5–6.5 (long), 7.6 (short)
ESCOSA	May 2013	Water	6.0
IPART	May 2013	Water	Mid-point WACC, using 5.5–6.5 (long), 7.4 (short)

[1211] For the bottom of the range, see: ERA, *Draft decision on proposed revisions to the access arrangement for the mid-west and south-west gas distribution system—Submitted by ATCO Gas Australia Pty Ltd*, 14 October 2014, p. 161. For the top of the range, see: IPART, *NSW rail access undertaking review of the rate of return and remaining mine life—Transport final report and decision*, July 2014, p. 13.

Regulator	Decision date	Sector	MRP (%)
QCA	April 2013	Water	6.0
ERA	March 2013	Water	6.0
ERA	November 2012	Electricity	6.0
ESCV	June 2012	Rail	6.0
IPART	June 2012	Water	5.5–6.5
IPART	June 2012	Water	5.5–6.5

Source: Independent Pricing and Regulatory Tribunal (IPART), Economic Regulation Authority (ERA), Essential Services Commission of Victoria (ESCV), Essential Services Commission of South Australia (ESCOSA), Queensland Competition Authority (QCA), Northern Territory Utilities Commission (NTUC), Tasmanian Economic Regulator (TER).[1212]

C.6 Adjusting for imputation credits in the MRP

Insofar as investors value imputation credits, the definition of the equity risk premium in SLCAPM should account for the capitalised value of personal tax credits. This is

[1212] ESCV, *Proposed approach to Melbourne Water's 2016 water price review—Consultation paper*, February 2015, p. 39; IPART, Fact *sheet: WACC biannual update*, February 2015, p. 2; QCA, *Draft report: Gladstone area water board price monitoring 2015–2020*, February 2015, p. 42; TER *Draft report: 2015 price determination investigation—Regulated water and sewerage services*, January 2015, p. 41; ERA, *Revised draft decision: Review of the method for estimating the weighted average cost of capital for the regulated rail networks*, November 2014, p. 98; ERA, *Determination on the 2014 weighted average cost of capital for the freight and urban railway networks*, 24 October 2014, p. 5; ERA, *Draft decision on proposed revisions to the access arrangement for the mid-west and south-west gas distribution system—Submitted by ATCO Gas Australia Pty Ltd*, 14 October 2014, p. 168; QCA, *Final report: SEQ Retail Water long-term regulatory framework—Weighted average cost of capital (WACC)*, September 2014, p. 18; QCA, *Draft decision: Aurizon Network 2014 draft access undertaking—Maximum allowable revenue*, September 2014, p. 237; QCA, *Final decision: Cost of capital market parameters*, August 2014, p. 59; IPART, *NSW rail access undertaking review of the rate of return and remaining mine life—Transport final report and decision*, July 2014, p. 13; NTUC, *Network price determination, Part A—Statement of reasons*, April 2014, p. 120; IPART, *Essential Energy's water and sewerage services in Broken Hill—Final report*, June 2014, p. 165; ERA, *Determination on the 2013 WACC for the freight and urban railway networks*, July 2013; ESC, *Price review 2013: Greater metropolitan water businesses—Final decision*, June 2013; ESC, *Price review: Regional urban water businesses—Final decision*, June 2013; ESC, *Price review 2013: Rural water businesses—Final decision*, June 2013; IPART, *Hunter Water Corporation: Final report*, June 2013, p. 193; IPART, *Gosford City Council and Wyong Shire Council, Water—Final Report*, May 2013; ESCOSA, *SA Water's water and sewerage revenues 2013/14–2015/16*, May 2013; QCA, *Final report: Seqwater irrigation price review 2013-17*, vol. 1, April 2013; ERA, *Inquiry into the efficient costs and tariffs of the Water Corporation, Aqwest and the Busselton Water Board*, March 2013; ERA, *Further final decision on proposed revisions to the access arrangement for the Western Power network*, 29 November 2012, p. 21; ESCV, *V/line access arrangement final decision*, June 2012; IPART, *Water—Final report: Review of prices for Sydney Water Corporation's water, sewerage, stormwater drainage and other services: From 1 July 2012 to 30 June 2016*, June 2012; IPART, *Water—Final report: Review of prices for Sydney Catchment Authority: From 1 July 2012 to 30 June 2016*, June 2012.

because under an imputation tax system, some personal tax payments will be capitalised into the risk premium.[1213]

The risk premium will reduce when some personal tax payments are capitalised into it. Therefore, we need to adjust the MRP to include personal tax credits. This adjustment is required to calculate the return on equity that reflects an after-company tax but before-personal tax return. This is to be consistent with the return on capital and cash flows which are defined on an after company tax but before personal tax basis.[1214] It is also a requirement in the NER and NGR.[1215]

C.6.1 Adjustment to historical excess returns

Post-imputation (July 1987) returns consist of capital gains, dividends and the value of attached imputation credits. However, stock accumulation indices in Australia only include returns from dividends and capital gains. Therefore, market indices implicitly attribute no value to imputation credits distributed to investors. We estimate investors value distributed franking credits at 60 per cent of their face value (see attachment 4—value of imputation credits). Therefore, we must add back the value of imputation credits to the stock accumulation index. Otherwise, we will underestimate the after-corporate, before-personal tax return on equity.[1216]

We use the methodology applied by Brailsford et al to adjust our historical excess returns estimates for the value of imputation credits. Brailsford et al. estimated a series for the value of imputation credits. This entailed the following:[1217]

- Estimating an annual series of imputation credit yields applicable to the underlying stock index.
  - For the period 1998 to 2005, using the weighted average imputation credit yield on the Australian ASX All Ordinaries index for the 12 months ending December of each year. Brailsford et al. sourced these data from the Australian Taxation Office (ATO).
  - Estimating the weighted average imputation credit yield, ct for each year, t for the period 1988 to 1997. This is because the relevant ATO data are unavailable prior to 1998.[1218]

1213 Officer, 'The cost of capital under an imputation tax system', *Accounting and Finance*, May 1994, 34, p. 1.

1214 Officer, 'The cost of capital under an imputation tax system', *Accounting and Finance*, May 1994, 34, pp. 1, 10.

1215 NER, cl. 6.5.2(d)(2), 6A.6.2(d)(2); NGR, r. 87(4)(b).

1216 Officer, 'The cost of capital under an imputation tax system', *Accounting and Finance*, 1994, 34, 1–17.

1217 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 84–85.

1218 This is calculated using the model: ct = pt × dt × [Tt/(1-Tt)]. This is where dt is the annual dividend yield implied from the Historical Stock Price Index and the Historical Stock Accumulation Index. Further, pt is the average proportion franked (75%) and Tt is the tax rate at which dividends are franked (the statutory tax rate for the relevant year).

- Adjusting the series of estimated imputation credit yields for the amount that investors value them (theta). Our adjustment is based on investors valuing distributed franking credits at 60 per cent of their face value.

The methodology applied by Brailsford et al. entails calculating the total value of returns using actual market returns, dividends and imputation credits (adjusted for the amount that investors value them).[1219] As such, we have confidence in these estimates. We note that Handley also applied this methodology when he updated the Brailsford et al. study.[1220]

NERA also applied the Brailsford et al. methodology to adjust its historical excess returns estimates for the value of imputation credits.[1221] The majority of service providers proposed NERA's historical excess returns estimate.[1222] This adjustment is also consistent with our adjustment to account for imputation credits in the DGM.

C.6.2 Adjustment to the dividend growth model

We also incorporate the value of imputation credits in our DGM. Under DGMs, the price of a share is equal to the discounted stream of expected future dividends per share into perpetuity.[1223] Therefore, under the DGM, the benefits of imputation credits are accounted for using the following equation:

$$Dividend\ including\ imputation\ benefits = Cash\ dividends \times \left[1 + \frac{\rho \times \theta \times \tau}{1 - \tau}\right]$$

Where: τ is the corporate tax rate, which equal 30 per cent.

ρ is the proportion of dividends that are franked, which is 0.75

θ is the utilisation rate, which is 0.6

1219 This is known as 'the utilisation rate' or 'theta' (θ).

1220 Handley, *An estimate of the historical equity risk premium for the period 1883 to 2011*, April 2012; Handley, *An estimate of the historical equity risk premium for the period 1883 to 2010*, January 2011.

1221 NERA, *The market, size and value premiums*, June 2013, p. 46; NERA, *Memo on revised MRP estimates*, 14 November 2014, p. 1; NERA, *Historical estimates of the market risk premium*, February 2015, pp. 40–41.

1222 JGN, ActewAGL, submitted SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 23 with their revised proposals. SFG uses estimates of historical excess returns in NERA, *Historical estimates of the market risk premium*, February 2015. TransGrid proposed a return on capital estimated in NERA, *Return on Capital of a Regulated Electricity Network*, May 2014, p. 80. This refers to NERA, *The Market Risk Premium*, October 2013, page iii. TransGrid only updated the risk free rate in its revised proposal (see: TransGrid, Revised revenue proposal, January 2015, p. 115). The NSW DNSPs submitted CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 5 with their revised proposals. CEG uses estimates of historical excess returns in NERA, *Historical estimates of the market risk premium*, February 2015. Ergon Energy and SA Power Networks submitted SFG, The required return on equity for regulated gas and electricity network businesses, May 2014, p. 51 with their proposals and Energex submitted SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 30 with its proposal. SFG uses estimates of historical excess returns in NERA, *The market, size and value premiums*, June 2013.

1223 Discounting is the process of adjusting each cash flow for the time value of money and for risk. See AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, p. 114.

This is theoretically sound because only dividends (not capital gains) come with imputation credits. Further, Lally reviewed this adjustment and concurred with it. He also agreed a reasonable estimate of the proportion of full franked dividends is 0.75, which we draw from the empirical study produced by Brailsford et al.[1224] Therefore, we have some confidence in this method, which entails adjusting dividends directly for the value of imputation credits.

C.6.3 SFG's adjustments

In providing an estimate of the MRP, SFG undertook a number of adjustments to account for the value of imputation credits. We discuss these below.

Adjusting the dividend growth model

In its 2014 and 2015 reports for several service providers, SFG estimated the MRP implied by a DGM. For these estimates, SFG applied an adjustment for imputation credits, which it considered uses Officer's (1994) formula.[1225] SFG provided a worked example of this adjustment as follows:[1226]

$$Market\ ROE\ with\ imputation\ benefits =$$
$$Market\ ROE\ excluding\ imputation\ benefits\ \times \left[1 + \frac{\gamma\tau}{1-\tau}\right]$$

$$Market\ ROE\ with\ imputation\ benefits = 10.12\% \times \left[1 + \frac{0.5 \times 0.3}{1-0.3}\right] = 12.29\%$$

SFG then derived an MRP with imputation benefits by deducting the risk free rate from the market return on equity with imputation credits. That is, the MRP would equal $12.29\% - 4.12\% = 8.17\%$. Updating SFG's worked example for a gamma of 0.4 yields an MRP estimate of 7.73 per cent.[1227]

This adjustment differs from the adjustment typically used in the past, and to that in the Guideline.[1228] We did not agree with this proposed departure from the Guideline in the

1224 Lally, *Review of the AER's proposed DGM*, December 2013, p. 14. Reference to Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 85.

1225 SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 41, 73; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 49; SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 61; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 17–21.

1226 SFG assumes an ex-imputation MRP of 6.0 per cent, a risk free rate of 4.12 per cent and a gamma of 0.5. Also, we have rearranged the equation in SFG's report: $ROE\ with\ imputation\ benefits = ROE\ excluding\ imputation\ benefits \div [(1-T)/(1-T(1-\gamma))]$. See SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 41, 73.

1227 Under this approach, when gamma equals 0.4, the return on equity with imputation credits equals $10.12 * [1 + (0.4 * 0.3)/(1-0.3)] = 11.85$. Deducting a risk free rate of 4.12 per cent results in an MRP of 7.73 per cent.

1228 This is the adjustment set out by Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 73–97.

November 2014 draft decisions, and we continue to disagree with it in this decision. Our reasoning is as follows:

- SFG's suggested adjustment grosses up the entire return and incorporates it into the MRP. This is consistent with 100 per cent of the return coming from dividend income. However, returns are comprised of both dividends and capital gains. Therefore, we consider this is likely to overestimate the MRP. In his report to the Queensland Competition Authority (QCA), Lally commented on the same adjustment; which SFG proposed:[1229]

  > the process for adjusting for imputation credits presumes that there are no expected capital gains, i.e., expected returns to equity holders take the form of only dividends and imputation credits. However, the empirical evidence refutes this assumption and the result is that the modified MRP estimate using this approach would be too high.

- The Officer (1994) formula, when applied as SFG proposed, only holds in perpetuity.[1230] This can create an internal inconsistency because SFG has proposed we apply a perpetuity formula to non-perpetuity returns estimated from DGMs (as well as market surveys and independent expert reports).[1231] McKenzie and Partington advised that it is problematic to gross up a post-tax return to get a pre-tax return because the adjustment applied in the Officer (1994) formula, 'can only be relied on for perpetual cash flows'.[1232] Handley also observed:[1233]

  > The conversion formula [SFG refers to] is indeed appropriate in the setting that Officer (1994) considers but is in general not correct in non-perpetuity settings. In this case, it is appropriate to use theta to directly gross-up the imputation credits associated with the dividend component of the return rather than grossing-up the entire return.

- SFG's suggested adjustment is inconsistent with the adjustment we and service providers apply to estimate historical excess returns.

- SFG's main reason for proposing this alternative adjustment appears to be that SFG considers it is more consistent with how we adjust for imputation credits in the post-tax revenue model (PTRM).[1234] We have a number of concerns with SFG's reasoning (see section C.6.4).

1229 Lally, *Response to submissions on the risk-free rate and the MRP*, October 2013, p. 14. In response to SFG, *Response to the QCA Discussion Paper: Report for Aurizon Ltd*, 2013.

1230 A perpetuity is a special case of an annuity where the life of the equal cashflows is infinite. See Bishop, S., Faff, R., Oliver, B, Twite, G, *Corporate finance*, Ed. 5, 2004, Pearson Prentice Hall, p. 50.

1231 In contrast, where we consider imputation-exclusive returns arising from the DGM, we recognise that this is not a perpetuity and only adjust the dividend component. This recognises returns are comprised of both dividends and capital gains in practice.

1232 McKenzie and Partington, *Report to the AER: The DGM*, December 2013, p. 24.

1233 Handley, *Advice on the return on equity*, 16 October 2014, p. 22.

1234 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*

Adjusting survey evidence

In its 2014 and 2015 reports, SFG proposed adjusting MRP estimates from market surveys using the same method it used to adjust MRP estimates from DGMs.[1235] We did not agree with this position in the November draft decisions, and we do not agree with this position for this decision. This is for the following reasons:

- Truong, Partington and Peat suggested survey respondents do not adjust for imputation credits if they consider rate of return estimates already account for imputation credits.[1236]
- Survey respondents may use their understanding of long run historic average returns in forming their MRP estimates. If so, the adjustment for imputation credits is only required if respondents attach significant weight to the post imputation period and if the estimate of average returns for that period is lower due to the effect of imputation credits.[1237]
- McKenzie and Partington advised:[1238]

> Given that we don't really know whether survey responses do, or do not, allow for imputation credits and given that any adjustment for imputation would likely lie within the margin of measurement error, it seems best to take the survey evidence at face value, but tempered by the uncertainty about whether an imputation adjustment is needed.

- In his advice to the QCA, Lally advised:[1239]

> Furthermore, even if practitioners in general do not take account of imputation in the sense of explicitly allowing for it in their modelling, they are likely to have been influenced to some degree by the 6% estimate generally used by Australian regulators and this estimate does incorporate the effects of imputation.

Even if we assume survey respondents exclude the value of imputation credits, we would not agree with making the adjustment as SFG has proposed. We set out our reasons for this position under 'adjusting the dividend growth model' in section C.6.3.

network, 13 February 2015, p. 17; SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, p. 41.

1235 SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 71, 78; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 47–49; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 26. SFG did not provide any new information in its 2015 report (relative to its 2014 reports) to support its position on adjusting MRP estimates in market surveys for the value of imputation credits.

1236 Truong, Partington, Peat, 'Cost of capital estimation and capital budgeting practice in Australia', *Australian Journal of Management*, 2008, 33, pp. 95–121.

1237 McKenzie and Partington, *Supplementary report on the equity MRP*, February 2012, pp. 16–17.

1238 McKenzie and Partington, *Supplementary report on the equity MRP*, February 2012, p. 17.

1239 Lally, *Response to submissions on the risk-free rate and the MRP*, October 2013, p. 15.

Adjusting independent valuation reports

We do not use independent valuation reports to inform our estimate of the MRP.[1240] In its 2014 and 2015 reports, SFG proposed adjusting MRPs estimated in independent valuation reports for the value of imputation credits using the same method it used to adjust MRP estimates from DGMs.[1241] We did not consider it necessary to adjust these estimates for our purposes in the November 2014 draft decisions and we maintain this position for this decision. We have formed this view because we only use independent valuation reports to compare current return on equity estimates to a baseline value (directional information).[1242] Since we are only interested in the relative value of these estimates, as long as the return on equity in independent expert reports is measured consistently, this would not raise any concerns. As such, we consider there is little value in adjusting these estimates for the value of imputation credits.

We base our decision to only use independent valuation reports for directional information on the following:[1243]

- when firms undertaking valuations have regard to current market conditions, they may make unexplained adjustments to their assumptions and point estimates
- there may be important idiosyncrasies in the analysis within independent valuation reports.[1244]

However, since some service providers proposed we use this information to derive a point in time estimate, we have considered what kind of adjustment might be appropriate. SFG applied the adjustment discussed in section C.6.3. We do not agree with applying this adjustment. We set out our reasons for this position under 'adjusting the dividend growth model' in section C.6.3.

Our discussion of independent valuation reports in step four of our foundation model approach shows, for comparative purposes, return on equity estimates that are both adjusted for dividend imputation and unadjusted.[1245] For this purpose,[1246] we have adjusted the return on equity estimates from independent valuation reports by grossing up the valuer's market risk premium estimate by an amount equal to the average

1240 See steps one and two in section 3.4.1 of this attachment.

1241 SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 71, 78; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 53–54; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 27. SFG did not provide any new information in its 2015 report (relative to its 2014 reports) to support its position on adjusting MRP estimates in independent expert reports for the value of imputation credits.

1242 AER, *Explanatory statement rate of return guideline*, 17 December 2013, p. 61.

1243 See steps one and two in section 3.4.1 of this attachment.

1244 CEPA, *Australian energy regulator: Victorian gas networks market evidence paper*, February 2013.

1245 See step four in section 3.4.1 of this attachment.

1246 Our discussion under step two in section 3.4.1 and in appendix E2 of this attachment outlines our concerns with grossing up return on equity estimates from independent valuation reports to account for dividend imputation.

franking rebate yield (as published by the ATO) multiplied by the franking credit utilisation rate.[1247]

C.6.4 Internal consistency

We do not agree with the upward adjustment SFG applied to its return on equity estimates from the DGM, independent expert reports and market surveys.[1248] SFG applied a formula to adjust for imputation credits because it considers these estimation methods produce a return on equity that excludes the value of imputation benefits.[1249] The relevant value is the return on equity including the value investors receive from imputation credits. SFG adjusted its starting estimates using the Officer (1994) relationship:[1250]

$$ROE\ including\ imputation\ benefits = ROE\ excluding\ imputation\ benefits \times \left[1 + \frac{\gamma T}{1-T}\right]$$

Where: ROE is the return on equity and T is the standard corporate tax rate (in SFG's implementation)

This differs from the formula we use to incorporate the value investors receive from imputation credits. We do not apply the Officer (1994) formula in these instances for the reasons outlined in section C.6.3.[1251]

SFG appears to justify using the Officer (1994) adjustment on the basis that we make the same adjustment in our PTRM, and that consistency with the PTRM is the key consideration.[1252] We consider it is important to adjust our MRP estimates for imputation credits in a manner that is theoretically correct (that is, recognising returns are non-perpetual and comprised of both dividends and capital gains in practice). We recognise the Officer framework underlies our treatment of imputation credits, including our derivation of discount rates and cash flows. However, we consider our PTRM does

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1247 This is also the approach adopted by Brailsford, Handley, and Maheswaran (2012) when estimating historical excess returns.

1248 See SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 41, 71–73, 78–79; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 47–49, 53; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, pp. 26–27; SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, pp. 61–63; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 17–21.

1249 We do not agree, as set out in the previous section.

1250 R. Officer, 'The cost of capital of a company under an imputation tax system', *Accounting and Finance*, May 1994.

1251 Under the heading 'Adjusting the dividend growth model'.

1252 That is, SFG does not state that its approach is theoretically correct. See: SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 17–20; SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 63. SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, p. 39.

not apply the Officer relationship in the manner SFG described.[1253] Namely, the PTRM does not strictly apply the Officer formula, but instead explicitly models the non-perpetuity aspect that causes the formula to not apply. For example, SFG's position differs from ours in the following respects:

- The PTRM does not scale down the imputation-inclusive return on equity using the Officer formula to produce an imputation-exclusive return on equity. Rather, the PTRM takes the imputation-inclusive return on equity as a starting input. That is, the PTRM provides the entire imputation-inclusive return on equity in the return on capital building block. It then undertakes a bottom-up assessment of taxable income and the resulting imputation credits to determine what value the equity holders will receive from this source.[1254] The PTRM deducts this amount from the tax building block to ensure that equity investors receive (in total) the target imputation-inclusive return on equity.[1255]
- The bottom-up approach we apply in the PTRM produces different results to what arise when applying the Officer (1994) formula in a top-down fashion, as per SFG's implementation. Specifically:
    - If we populate our PTRM with non-perpetuity inputs, the bottom-up process in the PTRM will not systematically determine an imputation-exclusive return on equity that matches the theoretical top-down perpetuity formula adjustment that SFG proposes. Rather, the PTRM calculation will reflect the particular tax situation of the firm. That is, the PTRM determines the value of imputation credits from the imputation credits the firm generates (equal to the tax paid) and the degree to which investors value those imputation credits.[1256] This differs from the outcome produced in SFG's example proof in its 2013 report.[1257] In that example, SFG demonstrated that the PTRM's bottom-up calculation provided the same outcome as a top-down theoretical adjustment, in line with the Officer (1994) formula. However, this outcome was dependent on the example inputs SFG selected (which were perpetuity-consistent).[1258] This reflects our adoption of the Officer framework as a base for the model.

1253 *Appendix A: Transmission post-tax revenue model – Version 2*, December 2010, https://www.aer.gov.au/node/9926; *Appendix B: Amended distribution post-tax revenue model (PTRM)*, 19 June 2009, https://www.aer.gov.au/node/7003.

1254 The value ascribed to imputation credits (gamma) is an input into the PTRM.

1255 If this was not deducted, equity holders would receive double compensation for the value of imputation credits; once in the return on capital building block, and once in the tax building block.

1256 The degree to which investors value imputation credits is consistent with the gamma parameter in the PTRM. We define the imputation credit distribution rate of the benchmark firm to equal the market wide imputation credit distribution rate. Similarly, we define value of a received credit to the benchmark firm's investors to be equal to the market-wide average.

1257 SFG, *Dividend discount model estimate of the cost of equity*, 19 June 2013, pp. 37–40.

1258 SFG explicitly assumes regulatory depreciation will equal tax depreciation—or equivalently that assets never depreciate, as in a perpetuity. There is no capex, and SFG also appears to assume that there is no inflation (since otherwise the real straight-line depreciation approach embedded in the PTRM would cause regulatory and tax depreciation to differ). SFG, *Dividend discount model estimate of the cost of equity*, 19 June 2013, pp. 37–38.

- In practice, we populate the PTRM with non-perpetuity inputs. For example, carryover tax losses may mean the business will pay no tax in a regulatory control period. In this case, the PTRM correctly determines that there will be no imputation credits to distribute. Therefore, the imputation-exclusive return to equity holders would equal the entire imputation-inclusive return on equity. If the PTRM was effectively applying the Officer (1994) formula, as stated by SFG, a significant proportion of the overall return would come from imputation credits—but it does not.[1259]
- Our practice of populating the PTRM with non-perpetuity inputs is evident in how we are considering the regulatory proposals currently before us. For example, we can compare the value equity investors receive from imputation credits produced by the PTRM with that produced under the theoretical Officer (1994) formula, as per SFG's report. In the PTRM, the value equity investors receive from imputation credits will be the difference between the effective post-tax return on equity with and without imputation credits.[1260] In Table 3-41, we express these as a percentage return to the equity holder relative to their overall equity investment—that is, an imputation credit yield. In Table 3-41, the imputation credit yields calculated by the PTRM differ from the Officer theoretical adjustment. This reflects the 'real world' application of the Officer framework in the PTRM—not the strict application of a perpetuity formula.

Table 3-41 Imputation credit yields calculated in the PTRM and by the Officer formula (%)

Network	Return on equity (imputation inclusive)	PTRM calculated imputation credit yield	Officer (SFG) formula imputation credit yield	Difference
ActewAGL distribution	8.10	1.24	1.19	0.06
ActewAGL transmission	8.10	1.07	1.19	–0.11
Ausgrid distribution	8.10	0.93	1.19	–0.25
Ausgrid transmission	8.10	0.75	1.19	–0.43
Directlink	8.10	1.12	1.19	–0.06

1259 More generally, this counter-example shows that the effective tax rate will be used instead of the standard corporate tax rate as in the SFG report.

1260 Cells E60 and E61 on the analysis tab on the standard transmission PTRM.

Network	Return on equity (imputation inclusive)	PTRM calculated imputation credit yield	Officer (SFG) formula imputation credit yield	Difference
Endeavour Energy	8.10	1.16	1.19	–0.02
Essential Energy	8.10	0.95	1.19	–0.24
TasNetworks	8.10	0.78	1.19	–0.40
TransGrid	8.10	1.09	1.19	–0.09
Average	8.10	1.01	1.19	–0.17

Source: AER analysis.

Notes: This table shows figures from all November 2014 draft decisions, where gamma is set to 0.4. It does not show JGN because JGN does not use our standard PTRM. We have preserved the draft decision figures because updating to use final and/or preliminary decision figures would not change the substantive point, and these numbers are referenced in SFG's latest (2015) report.

SFG's latest (2015) report now appears to accept that the AER's PTRM does not apply the Officer perpetuity formula, unless the PTRM is altered so that tax depreciation equals regulatory depreciation.[1261] SFG considers that this 'simple change' is incidental to the core issue, and so contends that the AER is indeed applying the Officer perpetuity in the PTRM to (inconsistently) scale returns to businesses.[1262]

We understand that, if all areas of the model that deal with modelling the specific tax situation of the firm are removed, it will produce the Officer perpetuity result.[1263] This is entirely consistent with the November 2014 draft decisions and our reasoning above. However, this is not an incidental change, as per SFG's 2015 report. Rather, it goes to the fundamental reason why our approach is reasonable, and SFG's approach is not.[1264]

[1261] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 17–21.

[1262] SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 19.

[1263] The SFG report focuses on the difference between tax depreciation and regulatory depreciation, but there are a number of other aspects of the PTRM which also have the same effect. Any aspect of the PTRM which causes the effective tax rate to differ from the statutory tax rate is relevant. These include the depreciation on the tax asset base, capital contributions, some incentive payments, and carry forward losses. Not all of these appear to be understood in SFG's report.

[1264] Compare with SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 20 (paragraph 113).

The Officer perpetuity framework, by construction, will always apply the statutory tax rate.[1265] However, beyond a perpetuity framework, the effective tax rate can differ from the statutory tax rate.[1266] The effective tax rate will usually be below the statutory tax rate by a substantial margin. In the real world, the main reason for this is that the Australian Tax Office (ATO) permits firms to depreciate their assets for tax purposes faster than they depreciate in economic terms. This leads to a lower assessment of taxable income, a lower tax assessment and a lower effective tax rate.[1267] Any change to the effective tax rate directly affects the imputation credit yield, because it affects the generation of imputation credits themselves. If less tax is paid, less imputation credits are generated.

SFG's 'simple change' is to set the effective tax rate back to the statutory tax rate.[1268] In other words, it reverses the relevant reason why the perpetuity framework will not hold in the real world. If this is done, the AER's standard PTRM then shows a result consistent with the theoretical formula—which demonstrates that it correctly implements the Officer framework. All this supports the idea that the AER's standard PTRM appropriately models the particular tax situation of the firm, building on the best available framework, and reflecting the real world where non-perpetuity inputs are required.[1269]

With this background, it is then clearer what SFG's 2015 report means when it alleges there is an inconsistency. SFG considers that, as a proportion of total return, the return from imputation credits for the benchmark firm (as modelled in the PTRM) must equal the return from imputation credits for the market as a whole (in the dividend discount model).[1270]

[1265] R. Officer, 'The cost of capital of a company under an imputation tax system', *Accounting and Finance*, May 1994., pp. 4, 13. This flows from the perpetuity definition, and in the worked example, since 13.58 / (39.96 – 5.14) = 39 per cent, the effective tax rate equals the statutory tax rate (as it must).

[1266] Of course, the statutory tax rate may coincide with the effective tax rate, but this is a rare event.

[1267] Note that, because the tax depreciation at the start of an asset's life is higher (than economic depreciation), the tax depreciation at the end of an asset's life is lower (than economic depreciation). However, because the ATO does not adjust for the time value of money, there is a net reduction in tax across the entire asset life cycle. This effect is enhanced by a growing asset base.

[1268] SFG has adopted a proof-by-example approach in its report on this matter, and the single change it makes to Transgrid would not work for other NSPs' PTRMs. However, if all necessary changes were made in other PTRMs so that the effective tax rate equals the statutory tax rate, the result demonstrated for TransGrid would hold. Finally, note that SFG's analysis does not address how we might reconcile the statutory tax rate with the market wide effective tax rate.

[1269] That is, the rules set by the ATO governing the calculation of deprecation for tax purposes are different to the rules governing the calculation of depreciation for regulatory purposes. Every network service provider will separately track the two forms of depreciation.

[1270] SFG focuses on the simplest case, where the return for the benchmark firm equals the return on the market, In this case, the imputation credit yield for the benchmark firm will equal the market wide average imputation credit yield. SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 18–20.

Our estimate of gamma for the benchmark firm (used in the PTRM) reflects market wide averages.[1271] Gamma encompasses the distribution of imputation credits and their valuation once received. In these respects, the benchmark firm will always match the market average.

However, prior to the distribution of imputation credits, they must be created by the payment of tax. Where firms pay different amounts of tax relative to their earnings, they are said to have different effective tax rates. Hence, SFG's consistency requirement is that the effective tax rate for the benchmark firm (as modelled in the PTRM) must equal the effective tax rate for the whole market.[1272]

We do not consider that the effective tax rate for the benchmark firm must equal the market wide effective tax rate. There will be a large spread of effective tax rates across the entire market, so there is no conceptual problem with the effective tax rate for an individual firm differing from the market average. Such an approach aligns with the actual tax circumstances of the firm.[1273]

We consider there is no inconsistency, because we use the appropriate figure in each context. It is correct, when preparing a market wide dividend discount model, to use the effective tax rate for the entire market.[1274] Similarly, it is correct, within the standard PTRM for an individual network service provider, to use the effective tax rate for that firm, having regard to its particular tax situation.[1275]

C.6.5 Assessment against our criteria

We must have regard to relevant estimation methods, financial models, market data and other evidence.[1276] In the Guideline, we proposed using criteria to assess the merits of the various sources of information in setting the allowed rate of return.[1277] Since service providers proposed an alternative adjustment for imputation credits (see section C.6.3), we have had regard to this as an estimation method. Table 3-42 sets out the assessment of our imputation adjustment and SFG's alternative adjustment against the criteria set out in the Guideline.

1271 While an alternative approach could have been taken, we adopted this approach after extensive consultation with stakeholders.

1272 SFG's whole-of-market illustrative example (paragraphs 106, 114) also appears to be incorrect because it assumes that, for the entire market, tax depreciation is equal to regulatory depreciation.

1273 That is, the rules set by the ATO governing the calculation of deprecation for tax purposes are different to the rules governing the calculation of depreciation for regulatory purposes. Every network service provider will separately track the two forms of depreciation.

1274 Note that although the statutory tax rate appears in the formula, our imputation adjustment in the dividend discount model uses the level of dividends and level of franking observed across the entire market (and hence tax paid across the entire market).

1275 This is still a benchmark assessment. The benchmark definition encompasses many characteristics, but still has regard to the specific circumstances of the firm (for instance, the size and age of its asset base).

1276 NER cl. 6.5.2(e)(1); NER, cl. 6A.6.2(e)(1); NGR, r. 87(5)(a).

1277 AER, *Rate of return guideline*, 17 December 2013, p. 6.

Table 3-42 Assessment of imputation adjustments against criteria

Criteria[1278]	AER adjustment	SFG's adjustment
Where applicable, reflective of economic and finance principles and market information. Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	Adjusting the MRP for the benefits of imputation credits is consistent with economic and finance principles. The adjustment applied by Brailsford, et al. is sound and well accepted.[1279] This is consistent with theory and empirical analysis indicating market returns comprise of dividends and capital gains.	Adjusting the MRP for the benefits of imputation credits is consistent with economic and finance principles. The Officer (1994) framework is sound and well accepted.[1280] However, we consider there are problems with applying the formula from Officer (1994) in the way SFG has proposed. SFG's application assumes market returns only include dividends, whereas empirical analysis indicates these also include capital gains.
Fit for purpose. That is, 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. Also, promote simple over complex approaches where appropriate	We base this adjustment on a formula that experts apply to adjust dividend cash flows directly. It can equally apply to the dividend component in our DGM and is therefore fit for purpose.	SFG's proposed use of the Officer (1994) framework differs from how we apply it in the PTRM. SFG's proposed adjustment formula entails applying a formula derived from a perpetuity to adjust a non-perpetuity. We do not consider this to be fit for purpose as it could produce unusual results.
Implemented in accordance with good practice. That is, supported by robust, transparent and replicable analysis that is derived from available credible datasets	The adjustment is transparent and replicable.	The adjustment is transparent and replicable. Applying the adjustment as SFG has suggested is likely inconsistent with data

1278 This table does not include the criteria for models and market data. These criteria do not apply to this source of information—which is essentially an adjustment formula, based on a theoretical principle.

1279 Brailsford, Handley, Maheswaran, ‘Re-examination of the historical equity risk premium in Australia’, *Accounting and Finance*, Vol. 48, 2008, pp. 84–85; Lally, Review of the AER's proposed DGM, December 2013, p. 14.

1280 Officer, 'The cost of capital under an imputation tax system', *Accounting and Finance*, May 1994, 34.

Criteria[1278]	AER adjustment	SFG's adjustment
		indicating returns include both dividends and capital gains.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	The adjustment does not hinder regulatory outcomes from reflecting changing market conditions.	The adjustment does not hinder regulatory outcomes from reflecting changing market conditions.

C.7 Potential relationships between the MRP and risk free rate

The evidence has not satisfied us that there is a clear relationship (positive or negative) between the 10 year forward looking risk free rate and MRP. In his 2015 report, Partington supported our view.[1281]

We assessed this issue at length in the Guideline and Victorian gas decisions, and this material remains relevant.[1282] In this material, we considered:

- the theoretical argument for an inverse relationship between the MRP and risk free rate
- the academic research on the topic
- the empirical evidence presented by the service providers and their consultants.

On the basis of the available evidence and submissions, we considered there is no clear relationship between the risk free rate and MRP. In their 2013 report, McKenzie and Partington undertook a comprehensive literature review and found there is evidence that supports both a positive and negative relationship.[1283] McKenzie and Partington also found there was some support in the literature for an oscillating relationship (that is, the relationship is at times positive and at other times negative).

In a number of reports for several service providers, CEG, SFG and Incenta submitted that the MRP has increased as CGS yields (our proxy for the risk free rate) have decreased, mainly because of a widespread 'flight to safety' or 'flight to quality' among

[1281] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 71–74.

[1282] 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.

[1283] McKenzie and Partington, *Review of the AER's overall approach to the risk free rate and market risk premium*, February 2013, pp. 6, 24.

investors.[1284] Table 3-43 shows how SFG's MRP and risk free rate estimates have varied over its expert reports from May 2014 to February 2015. It is clear from this table that SFG's MRP estimates have increased as its risk free rate estimates have decreased. SFG submitted that this is consistent with current market conditions, which indicate a 'flight to quality' period.[1285]

Table 3-43 MRP estimates from SFG's reports

SFG report date	MRP estimate (%)	Risk free rate estimate (%)
27 May 2014	7.21	4.12
14 August 2014	7.57	3.63
28 August 2014	7.57	3.63
8 September 2014	7.72	3.43
19 January 2015	7.92	3.08
30 January 2015	7.92	3.08
13 February 2015	8.17	2.64

Source: SFG reports[1286]

1284 CEG, *WACC estimates: A report for the NSW DNSPs*, May 2014, pp. 53–62; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, section 4 and appendix A; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 53–54, 57, 78; SFG, *Estimating the required return on equity: Report for Energex*, August 2014, pp. 31, 53; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, pp. 9, 41; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, pp. 22, 27–29, 34; SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, pp. 27–28; Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, pp. 8–10, 13–15; Incenta, *Further update on the required return on equity from independent expert reports: Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks, and United Energy*, February 2015, pp. 3–6, 11–12 (Incenta, *Further update on the required return on equity from independent expert reports*, February 2015).

1285 SFG, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*, 13 February 2015, p. 28.

1286 SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 8, 84; SFG, *Estimating the required return on equity: Report for Energex*, August 2014, pp. 20, 57; SFG, *Updated estimate of the required return on equity: Draft report for Ergon*, 14 August 2014, pp. 2, 4; SFG, *Updated estimate of the required return on equity: Report for SA Power Networks*, 8 September 2014, pp. 2, 4; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, p. 42; SFG, *The required return on equity: Initial review of the AER draft decisions: Report for Energex*, 30 January 2015, p. 43; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 33. SFG, *The required return on equity for the benchmark efficient entity*, 12 March 2015 did not provide an overall MRP estimate.

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. However, in his 2015 report, Partington advised that periods of low interest rates can also cause investors to engage in a 'search for yield'.[1287] He stated:[1288]

> There is also a widespread view that investors are engaged in a “search for yield”. This “search for yield” story has two versions. In both versions investors are taking on extra risk. The first version is that the low return on debt is causing investors to switch into shares with high dividend yields, resulting in a price premium for such shares. The second version is that in a search for higher yields investors are more willing to take on riskier investments. In other words, they are accepting a lower risk premium.

Moreover, current market evidence does not appear to be consistent with the view that there a widespread 'flight to quality' among investors. This can be seen in our consideration of conditioning variables and survey evidence. For example, during the GFC (where there might have been periods of widespread 'flight to quality') we saw a:

- decrease in CGS yields[1289]
- sharp increases in conditioning variables; dividend yields, credit spreads and implied volatility (see Figure 3-19 to Figure 3-22).

However, over the past 12 months, we have seen a:

- decrease in CGS yields[1290]
- limited movement in conditioning variables, which have remained fairly steady and close to their long term averages (see Figure 3-19 to Figure 3-22).

Partington considered that 'that the general and very substantial decline in credit spreads since the GFC seems inconsistent with increasing risk aversion'.[1291] Partington also noted that we should be cautious in using this evidence to infer a decrease in the MRP.[1292] This is because movements in the credit spread do not necessarily have direct parallels in movements of the equity risk premium.

We also received a submission in 2015 from the South Australian Centre of Social Service (SACOSS) and South Australian Centre for Economic Studies (SACES).[1293] In

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1287 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 72.
1288 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 72.
1289 See CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 23 (figure 5).
1290 See CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 23 (figure 5).
1291 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 74.
1292 Partington however noted that in previous regulatory determinations, regulated businesses and their consultants were arguing for a high equity risk premium because credit spreads were high as a consequence of GFC. See: Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 73–74.
1293 SACOSS, *Submission to SA Power Networks' regulatory proposal for 2015–20*, January 2015; SACES, *Independent estimate of the weight average cost of capital (WACC) for SA Power Networks 2015 to 2020: Final report*, January 2015, pp. 6–7.

this submission, SACES did not consider there is currently any robust evidence to suggest the market for Australian government securities is significantly affected by a 'flight to quality' among investors. It noted the ASX has been experiencing strong but not excessive returns over the past few years. It also noted the recent decreases in CGS yields have been accompanied by even larger falls in the yields on corporate debt. We have regard to this submission, but note that movements of stock index returns and corporate bond yields do not necessarily imply similar movements of the MRP.

We are not satisfied that there is a clear relationship between the risk free rate and MRP. We are not satisfied that there is evidence of a widespread 'flight to quality' among investors in current market conditions. In fact, there is evidence to suggest investors may be engaging in a 'search for yield'. Partington considered it is unlikely that the MRP has increased in response to recent decreases in the risk free rate. He stated '[t]he low bond rates tell us that the required return for low risk assets is low'.[1294] This is the benchmark rate against which other risky assets are priced to attract equity funds.

C.8 Selection of range and point estimate

We adopt an MRP point estimate of 6.5 from a range of 5.1 to 8.6 per cent. We are satisfied an MRP of 6.5 provides for a return on equity that contributes to achieving the allowed rate of return objective and has regard to prevailing conditions in the market for equity funds.[1295]

The MRP cannot be directly observed and there is no consensus among experts on which method produces the best estimate of the MRP.[1296] Therefore, we consider a range of conceptual and empirical evidence in estimating the MRP. This evidence comes from historical excess returns, DGM estimates, survey evidence and conditioning variables. We also have regard to recent decisions by Australian regulators.[1297]

C.8.1 Selection of range

Based on the evidence before us, we consider a range of 5.1 to 8.6 per cent is reasonable for the MRP under current market conditions. This is because:

- The geometric average historical excess return currently provides the lowest estimate of the MRP with a range of 3.9 to 4.9 per cent. McKenzie and Partington advised that 'the unbiased estimator of the MRP lies between the arithmetic

1294 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 72.

1295 NER, cll. 6.5.2(f–g); NER, cll. 6A.6.2(f–g); NGR, rr. 87(6–7).

1296 See Damodaran, *Equity risk premiums: determinants, estimation and implications - the 2012 edition*, March 2012, p. 93. He also noted: 'No matter what the premium used by an analyst, whether it be 3% or 12%, there is back-up evidence offered that the premium is appropriate'.

1297 AER, *Rate of return guideline*, 17 December 2013, p. 16.

average and the geometric average'.[1298] Therefore, while we have regard to geometric averages, we consider a reasonable estimate of the lower bound will be above the geometric average.[1299] Therefore, we apply a lower bound estimate of 5.1 per cent.[1300]

- Our DGM currently provides the highest estimate of the MRP at about 8.6 per cent, using the upper bound of our assumptions concerning the long term dividend growth rate.[1301] We apply this as the upper bound for the range.

We note the upper and lower bound estimates reflect the evidence before us and may change over time. This is consistent with having regard to prevailing conditions in the market for equity funds.[1302] The upper bound of the MRP range has increased by 80 basis points since the November 2014 draft decisions. This increase is wholly the result of increased DGM estimates of the MRP.

C.8.2 Selection of point estimate

Given the uncertainty in MRP estimation, we must exercise our regulatory judgement to determine the MRP point estimate from within the range. In deciding upon our point estimate of 6.5 per cent, we have considered the following sources of evidence:

- Historical excess returns—these estimates provide a range of 5.8 to 6.4 per cent if calculated using arithmetic averages and a range of 3.9 to 4.9 per cent if calculated using geometric averages. We consider 5.1 to 6.5 per cent a reasonable range and 6.0 per cent a reasonable point estimate based on this source of evidence.[1303]
- DGMs—these estimates, from two applications of the DGM and a range of inputs, suggest a range of 7.4 to 8.6 per cent for the two months to end February 2015.[1304]
- Survey evidence—surveys of market practitioners indicate that MRPs applied in Australia cluster around 6.0 per cent.[1305] This holds when considering averages, medians and modes across surveys.

[1298] McKenzie and Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, p. 5.

[1299] AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 83; AER, *Draft decision: SPI Networks access arrangemen*t, September 2012, Appendix B.2.1.

[1300] Consistent with the worked example in the Guideline, we set the bottom of the range as 20 basis points above the highest estimate from the range of geometric averages.

[1301] As such, this is a conservatively high estimate using our construction of the DGM. This estimate is for the two months ending February 2015.

[1302] NER, cll. 6.5.2(g); NER, cll. 6A.6.2(g); NGR, rr. 87(7).

[1303] In the worked example in the Guideline, we considered a reasonable MRP range based on historical excess returns evidence was 5.0 to 6.5 per cent, based on geometric mean estimates of 3.6 to 4.8 per cent and arithmetic mean estimates of 5.7 to 6.4 per cent. By setting the upper bound of the historical excess returns range at 6.5 per cent, we fully cover the historical excess returns estimates using arithmetic averages (the highest estimate using arithmetic averages is 6.41 per cent).

[1304] This end date is as close as practical to the publication of this decision. This is also close to the end of the averaging period used for the risk free rate (6 March 2015).

[1305] 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

- Conditioning variables—we consider the conditioning variables do not support an increase (or decrease) in the MRP above (or below) that implied by historical excess returns.[1306]
- We also have regard to recent decisions among Australian regulators—the majority of other regulators adopted an MRP estimate of 6.0 in their most recent decision or update. The range of MRP estimates adopted by each regulator's most recent decision or update is 6.0 to 7.9 per cent. The average of these decisions is 6.5 per cent.[1307]

We have also considered:

- Tribunal decisions—the Tribunal upheld our approach to estimating the MRP when APA GasNet appealed our decision in 2013.[1308] The MRP approach brought before the Tribunal was similar to that applied in this decision.[1309]
- The potential for a relationship between the risk free rate and the MRP—the evidence has not satisfied us that there is a clear relationship (positive or negative) between the 10 year forward looking risk free rate and MRP.
- Submissions received (from service providers and other stakeholders)—service providers have generally proposed an MRP at or above 6.5 per cent, and other stakeholders have generally recommended an MRP at or below 6.5 per cent.[1310]

Figure 3-23 displays our estimates of the MRP using historical excess returns, DGMs, surveys and other regulators' decisions. The squares represent point estimates, the

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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.

[1306] See section C.4 for more information on, and charts of, the conditioning variables.

[1307] In November 2014, the ERA released a revised draft decision of the WACC for regulated rail networks, which adopted an MRP of 7.9 per cent. This forms the top of the range, though we note that the ERA's estimate is based on the Wright approach, which is adopted after consideration of the annuity pricing approach used by the ERA in its rail access regime and which may not be applicable in our case (ERA, *Review of the method for estimating the weighted average cost of capital for the regulated railway networks – Revised draft decision*, 28 November 2014, p. 89). The bottom of the range is 6.0 per cent—the latest estimate of the MRP applied by the ESCV, ESCOSA, NTUC and TER. See: ERA, *Review of the method for estimating the weighted average cost of capital for the regulated railway networks—Revised draft decision*, 28 November 2014, p. 98; ESCV, *Proposed approach to Melbourne Water's 2016 water price review—Consultation paper*, February 2015, p. 39; TER *Draft report: 2015 price determination investigation—Regulated water and sewerage services*, January 2015, p. 41; NTUC, *Network price determination, Part A—Statement of reasons*, April 2014, p. 125; ESCOSA, *SA Water's water and sewerage revenues 2013/14–2015/16: Final determination—Statement of reasons*, May 2013, p. 136.

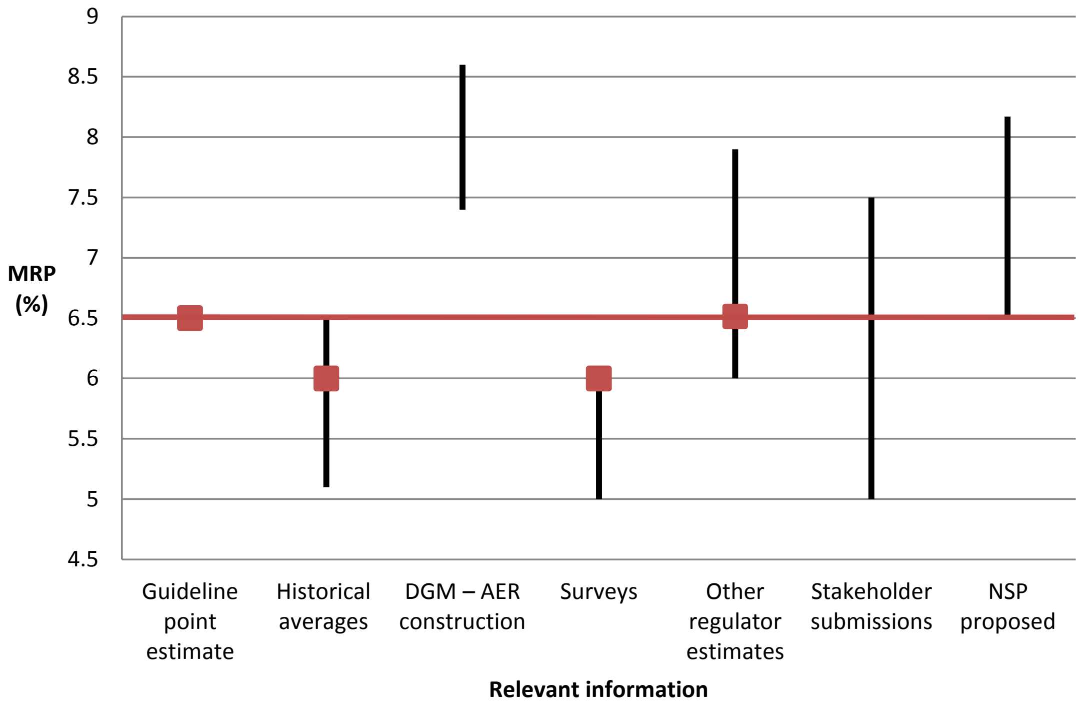
[1308] Australian Competition Tribunal, *Application by APA GasNet Australia (Operations) Pty Limited (No 2) [2013] ACompT 8*, 18 September 2013, Para 308.

[1309] The most notable change to our approach is that we now place more reliance on DGMs than using them as a cross check.

[1310] See discussion under 'Views of service providers and other stakeholders' in section C.8.2 for more information and full reference list.

vertical lines represent ranges and the red horizontal line represents our point estimate of 6.5 per cent.[1311]

Figure 3-23 Empirical estimates of the MRP against our point estimate of 6.5 (per cent)



Source: AER analysis

Note: The average of each state regulator's most recent decision/update on the MRP forms the point estimate (6.5 per cent) for other regulator estimates. In November 2014, the ERA released a revised draft decision of the WACC for regulated rail networks, which adopted an MRP of 7.9 per cent.[1312] This forms the top of the other regulator estimates range. The bottom of this range is 6.0 per cent—the latest estimate of the MRP applied by the ESCV, ESCOSA, NTUC and TER.[1313] The stakeholder 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 NSPs. The bottom and top of the stakeholder range comes from the CCP and

[1311] See appendix C–MRP for more information on these sources of information, and the ranges and point estimates we consider are consistent with these sources of information.

[1312] ERA, *Review of the method for estimating the weighted average cost of capital for the regulated railway networks—Revised draft decision*, 28 November 2014, pp. 89, 98. We note that the ERA's estimate is based on the Wright approach, which is adopted after consideration of the annuity pricing approach used by the ERA in its rail access regime and which may not be applicable in our case.

[1313] ESCV, *Proposed approach to Melbourne Water's 2016 water price review—Consultation paper*, February 2015, p. 39; TER *Draft report: 2015 price determination investigation—Regulated water and sewerage services*, January 2015, p. 41; NTUC, *Network price determination, Part A—Statement of reasons*, April 2014, p. 125; ESCOSA, *SA Water's water and sewerage revenues 2013/14–2015/16: Final determination—Statement of reasons*, May 2013, p. 136.

> Chamber of Commerce and Industry Queensland (CCIQ) respectively.[1314] The bottom of the NSP range comes from TasNetworks and Directlink's revised proposals which accept the Guideline approach and our draft decisions.[1315] The top of the NSP range comes from Jemena Gas Networks' (JGNs') revised proposal, which applies an MRP of 8.17 per cent.[1316]

Figure 3-23 shows that while DGM estimates indicate an MRP above 6.5 per cent, historical excess returns indicate an MRP of around 6.0 per cent. The other evidence we consider is consistent with an MRP of between 6.0 and 6.5 per cent.[1317]

We assigned a role to each source of relevant material for estimating the MRP in step two of our foundation model approach (see section 3.4.1). In determining these roles we assessed the merits and limitations of each source. We consider a reasonable application of this material is as follows:

- We place most reliance on historical excess returns. Therefore, we use this information to determine a baseline estimate of the MRP. We consider 6.0 per cent is, at this time, a reasonable point estimate based on this source of evidence.
- We place less reliance on our DGM estimates of the MRP. This information indicates whether we should select an MRP point estimate above or below the baseline estimate.
- We place some reliance on the other information (survey evidence and conditioning variables). This information, in conjunction with DGM evidence, helps to indicate how far above or below the baseline estimate the MRP point estimate should be. We use other Australian regulators' MRP estimates as a cross check on how we consider information.

In applying this approach to the evidence before us for this decision, we consider:

- 6.0 per cent is a reasonable point estimate based on historical excess returns evidence.

1314 The CCP submitted we should use an MRP of 5.0 per cent and the CCIQ submitted that we should select an MRP point estimate from a range of 5.0–7.5 per cent. CCP, *Response to AER draft determination for TasNetworks and TasNetworks' revised revenue proposal*, 18 February 2015, p. 4; CCP, *Response to AER draft determination for TransGrid and TransGrid's revised revenue proposal*, 16 February 2015, p. 7; CCP, *Submission: AER draft TransGrid determination TransGrid revised revenue proposal*, 6 February 2015, p. 13; CCP, *Response to AER draft determination for re: ActewAGL regulatory proposal 2014–19*, February 2015, p. 24; CCP, *Submission to AER: Responding to NSW draft determinations and revised proposals from electricity distribution networks*, 2 January 2015, p. 46; CCIQ, *Submission to Energex's regulatory proposal for 2015–20*, 30 January 2015, p. 16; CCIQ, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 20.

1315 TasNetworks, *Revised revenue proposal*, January 2015, p. 5. Directlink, *Revised revenue proposal*, January 2015, p. 11.

1316 JGN, *Revised access arrangement proposal*, February 2015, pp. 30–31.

1317 Figure 3-23 does not include evidence from conditioning variables because we do not derive quantitative estimates of the MRP from this source of evidence. However, we consider the conditioning variables we analyse do not support an increase (or decrease) in the MRP above (or below) that implied by historical excess returns.

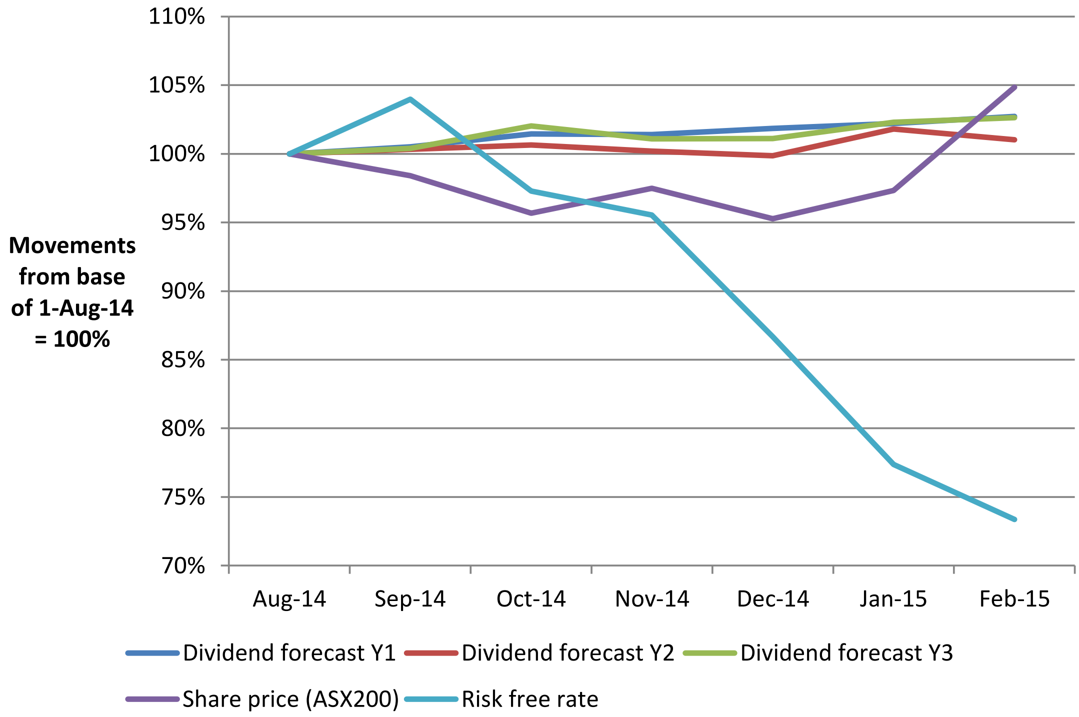
- Our DGM estimates (for the two months to end February 2015) range from 7.4 to 8.6 per cent. This indicates that there is evidence, at this time, supporting an MRP point estimate above 6.0 per cent.
- Survey evidence and conditioning variables are consistent with the baseline estimate of 6.0 per cent.
- Since our draft decisions in November 2014, the increase in MRP estimates derived from the DGM has largely been the result of a decrease in the risk free rate. Other inputs to the DGM have remained relatively steady. Figure 3-24 shows movements in the key DGM inputs (dividend forecasts and share price) and risk free rate since our application for the November 2014 draft decisions. We are not confident that the recent increases in our DGM estimates of the MRP necessarily reflect an increase in the 'true' expected 10 year forward looking MRP. We detail our reasons below. In summary:
    - We use conditioning variables as a directional indicator for the MRP because of their potential to detect changing market conditions. These indicate either no change or an easing in the MRP, which is a different outcome to our DGM estimates of the MRP. We also consider survey evidence provides forward looking estimates of the MRP based on investor expectations.
    - While we consider our DGM is theoretically sound, there are many limitations in practically implementing this model. For example, we consider our, and other, DGMs are likely to produce upward biased estimates of the MRP in the current market.[1318] We also consider our, and other, DGMs may not accurately track changes in the return on equity for the market.[1319] See section B.5 of appendix B–DGM for a more detailed discussion of sources of potential upward bias in our, and other, DGMs.
    - We do not consider there is a clear relationship (positive or negative) between the 10 year forward looking risk free rate and MRP (see section C.7). Partington considered it is unlikely that the MRP has increased in response to recent decreases in the risk free rate. He stated '[t]he low bond rates tell us that the required return for low risk assets is low'.[1320] This is the benchmark rate against which other risky assets are priced to attract equity funds.

1318 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.

1319 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.

1320 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 72.

Figure 3-24 Movements in DGM inputs and risk free rate



Source: AER analysis.

We are satisfied that the information set out above, at this time, could justify an MRP point estimate above the baseline of 6.0 per cent. However, we are not satisfied that it supports an MRP point estimate above the top of the range implied by historical excess returns (the source of evidence we place most reliance on). Therefore, we are satisfied that an MRP point estimate of 6.5 per cent reasonably reflects prevailing conditions in the market for equity funds and provides for a return on equity that contributes to the achievement of the allowed rate of return objective.[1321] It also provides a balance between the views of services providers and other stakeholders.

Evidence from other sources of information

We use conditioning variables as a directional indicator for the MRP because of their potential to detect changing market conditions. These do not support the view that the MRP has increased recently. For example:[1322]

- Dividend yields have been close to their long term average since approximately April 2013, with no discernible trend (see Figure 3-19).

[1321] NER, cll. 6.5.2(f–g); NER, cll. 6A.6.2(f–g); NGR, rr. 87(6–7).

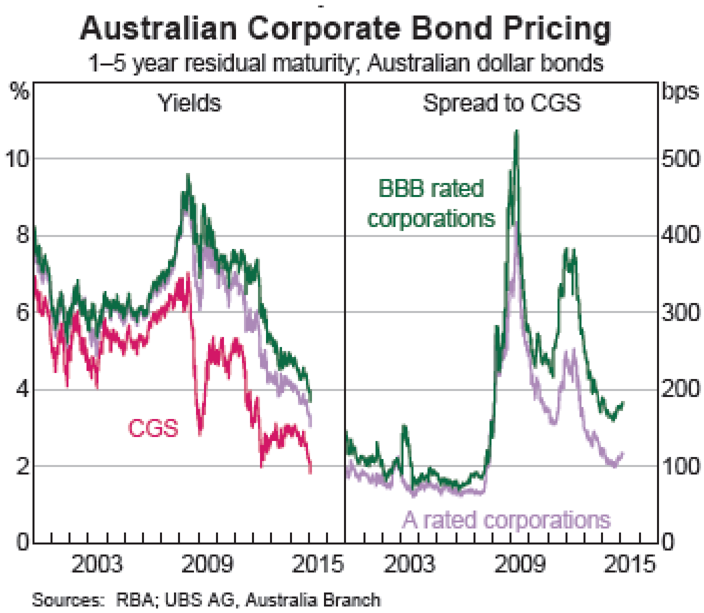
[1322] This information is as at 6 March 2015 (except for Australian corporate bond credit spreads, which is as at February 2015).

- Australian corporate bond credit spreads have been relatively steady over the last 12 months and now appear to be increasing slightly. The corporate bond spreads are above their pre-2007 levels but the swap spread is below its pre-2007 levels (see Figure 3-20). State government bond spreads appear to have increased slightly over the past 6 months but remain close to their pre-2007 levels (see Figure 3-21).
- Implied volatility has generally been below its long term average since around January 2013, with no discernible trend (see Figure 3-22).

We note similar patterns in other forward looking financial market indicators. For example:[1323]

- Figure 3-25 shows that Australian corporate bond yields have decreased significantly since about 2011, moving closely with CGS yields.
- Figure 3-26 shows Australian forward price-earnings ratios since 2003. The RBA, in its statement of monetary policy stated 'valuations of Australian equities, as measured by forward price-earnings ratios, have increased since the previous Statement to be above their decade averages for all sectors'.[1324] The RBA also noted that Australian equity prices have increased by 7 per cent since the start of 2015.

Figure 3-25 Australian corporate bond yields and spreads

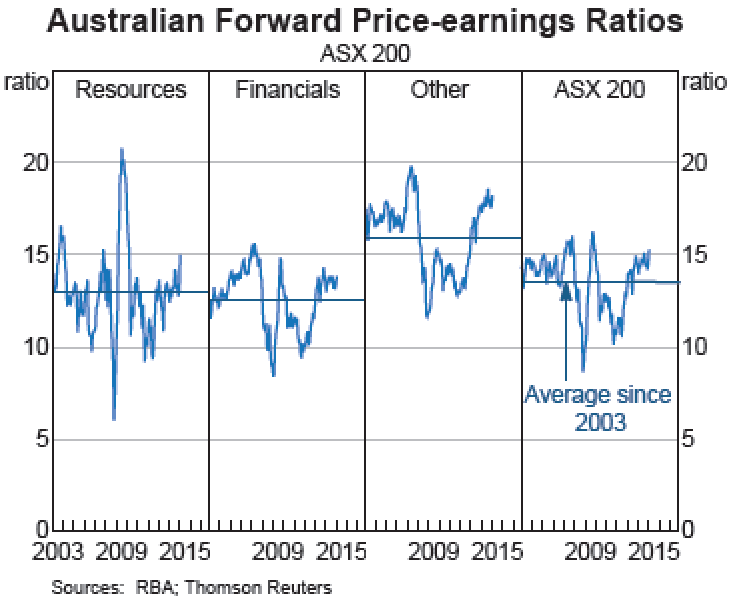


Source: RBA, *Statement of monetary policy*, February 2015, p. 56.

1323 This information is as at February 2015.

1324 RBA, *Statement of monetary policy*, February 2015, p. 59.

Figure 3-26 Australian forward price-earnings ratios



Source: RBA, *Statement of monetary policy*, February 2015, p. 59.

In steps one and two of our foundation model approach (see section 3.4.1), we note DGM estimates can reflect changes in market conditions. We also note conditioning variables have the potential to indicate changes in market conditions, even though it is difficult to derive a specific MRP estimate from this information. These two sources of evidence are not in line with each other.

Similarly, survey estimates of the MRP cluster around 6.0 per cent. We consider survey estimates are forward looking and reflective of investor expectations because they directly ask investors what they expect and/or apply in practice. While we recognise that these estimates have timeliness issues, the most recent (2014) survey does not indicate an increasing MRP expectation (see section C.3).

Together, the other information we rely on in estimating the MRP is consistent with our baseline estimate of the MRP of 6.0 per cent from historical excess returns. This evidence is not consistent with our DGM estimates of the MRP.

Limitations of DGMs

While we consider our DGM is theoretically sound, there are many limitations in practically implementing this model. We consider our, and other, DGMs are likely to produce upward biased estimates of the MRP in the current market and may not track changes in the return on equity for the market accurately. We discuss these limitations of our, and other, DGMs in detail in section B.5 of appendix B–DGM.

During the Guideline process, McKenzie and Partington and Lally reviewed our DGM construction.[1325] Since the Guideline, we have received new advice from McKenzie and Partington and Handley. Both experts reinforced and added to the limitations associated with implementing DGMs.

In their 2014 (and 2015) report, McKenzie and Partington advised that there is a significant risk that DGMs will overestimate the return on equity and hence also overestimate the MRP.[1326] They also advised that DGMs may incorrectly track changes in the return on equity.[1327] They provided the following reasons for these views:

- Analyst forecasts are well understood to be upward biased.[1328]
- DGMs use dividends as a proxy for free cash flow to equity, which is the share of the operating cash flow available for owners.[1329] However, there are a number of problems with this approach:
  - Differences between the free cash flow to equity and the dividend in a particular period 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 upward biased DGM estimates of the return of equity. McKenzie and Partington consider this may be less of a problem at the market level, but it is not guaranteed, particularly in times of crisis.[1330]
  - Dividends are a smoothed version of both free cash flow to equity and profits. This is because dividends follow slowly with changes in profits. Therefore, dividends are considered to be 'sticky' and are particularly sticky downwards because companies are more averse to cutting the dividend. Thus, if profits and free cash flow to equity drop, and investors revise their growth expectations downwards, the share price may drop significantly without the dividend changing. Together, this will cause a higher dividend yield, giving an upwardly biased estimate of the return on equity. The reverse occurs if profits and free cash flow to equity drop, but McKenzie and

1325 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.

1326 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 39; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 59.

1327 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 32; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 51.

1328 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; McKenzie and Partington, *The DGM*, December 2013, pp. 8–9.

1329 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.

1330 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.

Partington consider there is likely to be an asymmetry in the effects because of the greater reluctance to cut dividends than increase dividends.[1331]

- Analysts' forecasts are slow to adjust to the information in prices. This, in conjunction with the other limitations set out in this section, means that DGMs may not accurately track changes in the return on equity. McKenzie and Partington caution against relying on month by month, or even year by year, estimates from the DGM. They recommend averaging over several years because it is more likely to reduce measurement error.[1332] We note that we average our DGM estimates over two months because we consider longer averaging periods reduce the tracking ability of our DGM. However, we are mindful that our DGM may not be tracking changes in the return on equity for the market accurately.

Further, the risk free rate is currently lower than it has been recently. Our DGM does not include a term structure. This means that at any given point in time, the return on equity for the market is constant for all future periods in the DGM.[1333] Lally observed that if DGMs do not incorporate a term structure, these are likely to 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).[1334] Lally stated that:[1335]

> if the current ten year risk free rate were unusually low relative to its long-term average, and therefore could be expected to be higher in ten years' time, then the current ten-year MRP would have to be unusually high relative to its long-term average by an exactly offsetting amount. This 'perfect-offset' hypothesis is implausible.

McKenzie and Partington also 'recommend that it be borne in mind that the existence of a term structure could materially change cost of equity estimates from the DGM'.[1336] We provide reasons for why we do not incorporate a term structure in our DGM in section B.2 of appendix B–DGM. However, we are aware of this potential bias.

We consider there are merits associated with DGM estimates of the MRP, particularly in their ability to reflect changes in market conditions (which complements our use of

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1331 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.

1332 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; McKenzie and Partington, *The DGM*, December 2013, pp. 8–9.

1333 This means, at a given point in time, there is a uniform expectation of the return on equity across all periods in the DGM. However, this uniform expectation can change as one moves through time, because factors such as dividend forecasts, share prices or the expected growth rate in GDP can change over time. Therefore, when estimating the return on equity for the market at any given point in time, our DGM assumes that this estimate applies to all future periods. However, this does not mean our DGM always produces the same return on equity estimates for the market.

1334 Lally, *Review of the AER's Proposed Dividend Growth Model*, December 2013, pp. 11–12.

1335 Lally, *Review of the AER's Proposed Dividend Growth Model*, December 2013, pp. 11–12.

1336 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.

historical excess returns). However, it is important to be aware of the limitations associated with these estimates.

Potential relationships between the MRP and risk free rate

The evidence has not satisfied us that there is a clear relationship (positive or negative) between the risk free rate and MRP. In his 2015 report, Partington supported our view.[1337] We are not satisfied that there is evidence of a widespread 'flight to quality' among investors in current market conditions. In fact, there is evidence to suggest investors may be engaging in a 'search for yield', which is not consistent with an increase in the MRP.

This is discussed in detail in section C.7 of this appendix.

Views of service providers and other stakeholders

In this decision, we have regard to the views of service providers and other stakeholders. We consider an MRP point estimate of 6.5 per cent provides a balance between the views of service providers and other stakeholders.

The service providers have generally proposed an MRP above 6.5 per cent.[1338] For example:

- The NSW distribution network service providers proposed a long term historical MRP of 6.56 per cent (1883–2013 averaging period) based on CEG and NERA's 2015 reports.[1339]
- TransGrid did not propose a specific MRP estimate. Rather, it proposed an overall return on equity estimate based on NERA's analysis of various models and approaches. However, this included MRP estimates for different specifications of the SLCAPM and Black CAPM, which ranged from 6.5 (long-term SLCAPM) to 7.46 per cent (Wright approach).[1340]
- The other service providers have relied on SFG's weighted average method to estimate the MRP, which produced MRP estimates from 7.57 to 8.17 per cent, depending on the time of estimation.[1341] SFG's weighted average method places

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[1337] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 71–74.

[1338] This is with the exception of TasNetworks and Directlink, who have accepted our Guideline position and draft decision estimate of the MRP. See: TasNetworks, *Revised revenue proposal*, January 2015, p. 5; Directlink, *Revised revenue proposal*, January 2015, p. 11.

[1339] CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 5; NERA, *Historical estimates of the market risk premium*, February 2015, p. 42.

[1340] NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014, pp. 87–88. (NERA, *Return on capital of a regulated electricity network*, May 2014)

[1341] The other service providers are ActewAGL, JGN, Energex, Ergon Energy and SA Power Networks (SAPN). SFG, *Updated estimate of the required return on equity: Draft report for Ergon*, 14 August 2014, p. 4; SFG, *Updated estimate of the required return on equity: Report for SA Power Networks*, 8 September 2014, p. 4; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014; SFG, *The required return on equity: Initial review of the AER draft decisions: Note for ActewAGL, Ausgrid, Essential Energy and Endeavour Energy*, 19 most reliance on MRP estimates from its own DGM construction (50 per cent). It also places reliance on to MRP estimates from historical excess returns (20 per cent), the Wright approach (20 per cent) and independent valuation reports (10 per cent).

Stakeholder submissions (excluding submissions by service providers) generally supported an MRP at or below 6.5 per cent (see Table 3-44 at the end of this appendix). For example:

- The Consumer Challenge Panel (CCP) and Energy Users Association of Australia (EUAA) recommended an MRP of 5.0 per cent, at the bottom of the range determined in the Guideline.[1342] This appears to be based on outcome-based considerations regarding the profitability 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.
- The South Australian Council of Social Service (SACOSS) recommended an MRP of 6.0 per cent.[1343] This is based on advice from the SA Centre for Economic Studies (SACES). SACES recommended the MRP be constructed using MRP estimates from historical excess returns (post-1988) and DGM evidence (using a long run averaging period).
- The Queensland Council of Social Service (QCOSS) recommended an MRP of 6.0 per cent.[1344] This is based on advice from the Engineroom Consulting (Engineroom). Engineroom recommended the MRP be estimated by 'regression of a series of market data over an historical period of more than 50 years'. Engineroom considered the DGM model should not be used in estimating the MRP because it produces upward biased estimates.

In steps one and two of our foundation model approach (see section 3.4.1), we assess and give a role to each source of relevant material in estimating the MRP. We discuss:

- why we rely on more than historical excess returns estimates
- why we place less reliance on DGM estimates than historical excess returns estimates

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January 2015, p. 42 (SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015); SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 33.

1342 CCP, *Submission: AER draft TransGrid determination TransGrid revised revenue proposal*, 6 February 2015, p. 11; EUAA, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 15. These submissions referred to previous submissions: CCP, Submission on the TransGrid revenue proposal, 8 August 2014; EUAA, Submission to the NSW distribution network service providers' regulatory proposals for 2014–19, 8 August 2014.

1343 SACOSS, *Submission to SA Power Networks' regulatory proposal for 2015–20*, January 2015, p. 7; SACES, *Independent estimate of the WACC for SA Power Networks 2015 to 2020: Final report*, January 2015, pp. 7–11.

1344 QCOSS, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, pp. 78–79 and Appendix 1: Technical advice on the regulated rate of return—Engineroom Consulting.

- why we consider market surveys, conditioning variables and recent regulatory decisions provide valuable information for informing the estimate of the MRP
- why we consider the Wright approach and independent expert reports at the overall return on equity level (that is, in steps four and five).

In its 2015 report, SFG submitted that we have set a 'cap' for the MRP at 6.5 per cent based on our favoured subset of evidence (historical excess returns).[1345] It submitted we would not increase the MRP beyond this 'cap' even if all the other evidence supported an MRP above it. This is a mischaracterisation. We consider a range of information in estimating the MRP and we explain the application of our approach above. We are satisfied the information we consider in estimating the MRP, at this time, supports an MRP point estimate of 6.5 per cent. In this appendix, we also set out the reasoning for why we are satisfied that an MRP estimate of 6.5 per cent contributes to a rate of return that achieves the rate of return objective.

Service providers and other stakeholders have also submitted that their recommended MRP estimates (which range from 5.0 to 8.17 per cent)[1346] contribute to achieving the allowed rate of return objective.[1347] This highlights the divergence of views on estimating the MRP, even with the allowed rate of return objective as a common aim. Our MRP point estimate of 6.5 per cent lies between the estimates recommended by service providers and other stakeholders. Although our decision is based on the evidence before us and the achievement of the allowed rate of return objective, we consider it is important to be balanced and reasonable in our approach. This is particularly important given the divergence of views on how to best estimate the MRP.

[1345] SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 22.

[1346] This excludes the MRP estimate of 0.2 per cent proposed by the Alliance of Electricity Consumers. We consider this estimate to be unreasonably low and not supported with sufficient reasoning. The Alliance of Electricity Consumers set the required return on the market equal to the average return on equity specified in the annual reports of eight Queensland government owned corporations over 2009–10 to 2013–14 (3.83 per cent). To estimate the MRP, it subtracted the risk free rate proposed by Ergon Energy (3.63 per cent) (see: Alliance of Electricity Consumers, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 6). We do not consider it is appropriate to equate the average return on equity for eight businesses with the return on the market portfolio. Moreover, we do not consider a return on equity estimate based on eight Queensland government owned corporations is reflective of the return on equity for a benchmark efficient entity (which we define as a pure play regulated energy businesses operating within Australia).

[1347] See, for example, CCP, *Response to AER draft determination for TasNetworks and TasNetworks' revised revenue proposal*, 18 February 2015, p. 4; TSBC, *Submission to TasNetworks' revised revenue proposal and AER draft decision for 2014–19*, February 2015, p. 31; Origin, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 17; ActewAGL, Revised regulatory proposal, January 2015, p. 458; JGN, *Revised access arrangement proposal—Appendix 7.1: Return on equity response*, February 2015, p. 4.

Table 3-44 Submissions on the MRP

Support MRP less than 6.5%	Support Guideline / November 2014 draft decisions (MRP of 6.5%)	Support service providers' proposals (MRP greater than 6.5%)
EUAA	AGL Energy	Citipower and Powercor
Alliance of Electricity Consumers	Origin Energy	Jemena Limited
QCOSS	Australian PV Institute	United Energy
Total Environment Centre (TEC)	Energy Consumers Coalition of SA (ECCSA)	Australian Gas Networks
SACOSS	Major Energy Users (MEU)	SA Power Networks (SAPN)
Bell Bay Aluminium	Australian Civil and Administrative Tribunal (ACAT)	AusNet Services
Tasmanian Small Business Council (TSBC)		Energy Networks Association (ENA)
CCP		Ergon Energy
UnitingCare Australia		TasNetworks
		RARE Infrastructure

Submissions to the SA/Qld proposals; Submissions to NSW/ACT/Tas revised proposals and AER draft decisions.[1348]

[1348] Supportive of the Guideline and November 2014 draft decision approach: AGL, *Submission to Energex's regulatory proposal for 2015–20*, 30 January 2015, p. 16; Origin, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 17; AGL, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2015, p. 14; Australian PV Institute, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 6; Australian PV Institute, *Submission to SA Power Networks' regulatory proposal for 2015–20*, December 2014, p. 5; ECCSA, *Submission to SA Power Networks' regulatory proposal for 2015–20*, December 2014, p. 74; Origin, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2015, p. 13; MEU, *Submission to TasNetworks' revised revenue proposal and AER draft decision for 2014–19*, February 2015, pp. 56–57; Origin, *Submission to TransGrid's revised revenue proposal and AER draft decision for 2014–19*, 6 February 2015, p. 5; ACAT, *Submission to ActewAGL's revised regulatory proposal and AER draft decision for 2014–19*, 20 February 2015, p. 1; AGL, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 3; Origin, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 2. Supportive of MRP less than 6.5 per cent: EUAA, *Submission to Energex's regulatory proposal for 2015–20*, 30 January 2015, p. 14; Alliance of Electricity Consumers, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 6; QCOSS, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 73; TEC, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, February 2015, p. 20; SACOSS, *Submission to SA Power*

Note: The Chamber of Commerce and Industry Queensland (CCIQ) submitted a low MRP be used, preferably in the range of 5.0 to 7.5 per cent (see: CCIQ, *Submission to Energex's regulatory proposal for 2015–20*, 30 January 2015, p. 16; CCIQ, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 20). The Queensland Farmers' Federation (QFF) supports the CCIQ's submission (see: QFF, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 11). The Energy Markets Reform Forum (EMRF) considered the AER has been conservative in setting the MRP. However, its recommendation was for the AER to adopt 'the midpoint of any range of point estimates where there might be doubt' and then apply an overall level of conservatism to the final assessment of the allowed revenue (see: EMRF, *Submission to TransGrid's revised revenue proposal and AER draft decision for 2014–19*, January 2015, pp. 11–12). For this decision, this approach leads to an MRP greater than 6.5 per cent.

Networks' regulatory proposal for 2015–20, January 2015, p. 19; UnitingCare, *Submission to SA Power Networks' regulatory proposal for 2015–20*, February 2015, p. 32; Bell Bay Aluminium, *Submission to TasNetworks' revised revenue proposal and AER draft decision for 2014–19*, 6 February 2015, p. 1; TSBC, *Submission to TasNetworks' revised revenue proposal and AER draft decision for 2014–19*, February 2015, p. 31; EUAA, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 17; CCP, *Response to AER draft determination for TasNetworks and TasNetworks' revised revenue proposal*, 18 February 2015, p. 4; CCP, *Response to AER draft determination for TransGrid and TransGrid's revised revenue proposal*, 16 February 2015, p. 7; CCP, *Submission: AER draft TransGrid determination TransGrid revised revenue proposal*, 6 February 2015, p. 13; CCP, *Response to AER draft determination for re: ActewAGL regulatory proposal 2014–19*, February 2015, p. 24; CCP, *Submission to AER: Responding to NSW draft determinations and revised proposals from electricity distribution networks*, 2 January 2015, p. 46. Supportive of the service providers' proposals (excluding submissions by the service providers to their own review process): Citipower and Powercor, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 8; Jemena Limited, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 6; United Energy, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 8; Australian Gas Networks, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 7; SAPN, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 7; AusNet Services, *Submission to the ACT/NSW revised regulatory proposals and AER draft decisions for 2014–19*, 12 February 2015, p. 12; ENA, *Submission to the ACT/NSW revised regulatory proposals and AER draft decisions for 2014–19*, 13 February 2015, p. 15; Ergon Energy, *Submission to the ACT/NSW revised regulatory proposals and AER draft decisions for 2014–19*, 13 February 2015, p. 6; TasNetworks, *Submission to the ACT/NSW revised regulatory proposals and AER draft decisions for 2014–19*, 12 February 2015, p. 2; AusNet Services, *Submission to TransGrid's revised revenue proposal and AER draft decision for 2014–19*, 6 February 2015, p. 10; RARE Infrastructure, *Submission to the NSW distribution network service providers' revised regulatory proposals and AER draft decisions for 2014–19*, 13 February 2015, p. 2.

D Equity beta

The equity beta is a key input parameter in our foundation model, the Sharpe–Lintner capital asset pricing model (SLCAPM). It measures the sensitivity of an asset or business's returns to movements in the overall market returns (systematic or market risk).[1349] Because the SLCAPM works on the basis that investors can diversify away business–specific risk, only systematic risk is relevant for determining equity beta.[1350]

We adopt an equity beta point estimate of 0.7 from a range of 0.4 to 0.7 for a benchmark efficient entity. We consider an equity beta of 0.7 is reflective of the systematic risk a benchmark efficient entity is exposed to in providing regulated services. We are satisfied it is likely to contribute to the achievement of the allowed rate of return objective.[1351]

Our decision is based on the following analysis of the relevant information before us, having regard to regulatory precedent and the uncertainty inherent in estimating an unobservable parameter. On balance, we are not satisfied there is sufficient new evidence such that a departure from the Rate of Return Guideline (Guideline) approach for estimating equity beta would better achieve the allowed rate of return objective.[1352] This has the additional benefit of providing certainty and predictability for investors and other stakeholders.

This appendix sets out the reasoning behind our decision in detail. It also responds to the issues service providers have raised in their proposals and revised proposals.[1353] This appendix is structured as follows:

- conceptual analysis
- empirical analysis
- international empirical estimates
- the theory of the Black CAPM
- selection of range and point estimate.

D.1 Conceptual analysis

The conceptual issue we consider in this section is whether we can form an overall view on the systematic risk for the benchmark efficient entity relative to the market

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[1349] 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.

[1350] McKenzie and Partington, *Risk, asset pricing models and WACC*, June 2013, pp. 21–22

[1351] NER, cll. 6.5.2(c) and 6A.6.2(c); NGR, rule 87(3).

[1352] AER, *Rate of return guideline*, December 2013, p. 15.

[1353] The service providers who have submitted proposals are Ergon Energy, Energex and SA Power Networks (SAPN). The service providers who have submitted revised proposals are TransGrid, TasNetworks, Directlink, Ausgrid, Endeavour Energy, Essential Energy, ActewAGL and Jemena Gas Networks (JGN).

average firm. As discussed in step two of section 3.4.1, our conceptual analysis is necessarily qualitative in nature and is therefore used as a cross–check against the empirically derived range.

We consider it is possible to determine a conceptual expectation of the systematic risk of the benchmark efficient entity relative to the market average firm. This then gives us some insight into where the equity beta for the benchmark efficient entity sits relative to the average equity beta across all firms in the market, which is 1.0 by definition.[1354] Our conceptual analysis indicates that the equity beta of a benchmark efficient entity will be less than 1.0. This implies that returns to a benchmark efficient entity vary less with economic conditions than returns for the market as a whole. Professor Michael McKenzie and Associate Professor Graham Partington (McKenzie and Partington) supported this conclusion in their recent reports.[1355] We addressed this type of conceptual analysis at length in the Guideline and our 2012 decision for the Roma to Brisbane pipeline, and this material remains relevant.[1356] However, given submissions received, we have reviewed the material before us.

Two key types of systematic risk are relevant for this conceptual assessment: business risk and financial risk.

D.1.1 Business risk

Business risk in this context is referring to the systematic risk exposure of the underlying business assets.[1357] It is generally accepted that the benchmark efficient entity has lower business risk than the market average firm.[1358] We consider that

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[1354] More precisely, the value weighted average across all firms in the market is 1.0. As pointed out by McKenzie and Partington, the equal weighted average may not be 1.0, since larger firms may be unevenly distributed above or below 1.0. See: McKenzie and Partington, *Estimation of the equity beta (conceptual and econometric issues) for a gas regulatory process in 2012*, April 2012, p. 21. (McKenzie and Partington, *Estimation of equity beta*, April 2012)

[1355] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014. This report was updated in 2015 (Partington, *Report to the AER: Return on equity (Updated)*, April 2015). The material on conceptual analysis is the same in both reports so any reference to McKenzie and Partington's 2014 report in this section also applies to Partington's 2015 report.

[1356] AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 39–44; AER, *Draft decision: APT Petroleum Pipeline Pty Ltd, Access arrangement draft decision, Roma to Brisbane pipeline, 2012–13 to 2016–17*, April 2012, pp. 149–51, 315–319; AER, *Final decision: APT Petroleum Pipeline Pty Ltd, Access arrangement final decision, Roma to Brisbane Pipeline, 2012–13 to 2016–17*, August 2012, pp. 88–89.

[1357] We note business risk in this context is only systematic/market risk and does not include firm specific risk that can be diversified away.

[1358] McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 6, 10; SFG, *Equity beta: Report for Jemena Gas Networks, ActewAGL and Networks NSW*, May 2014, pp. 17–18. (SFG, *Equity beta*, May 2014); SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 60; SFG, *Beta and the Black capital asset pricing model: Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, Ausnet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, 13 February 2015, p. 42 (SFG, *Beta and the Black capital asset pricing model*, 13 February 2015); SFG, *Equity beta report prepared for APT Petroleum Pipelines Ltd*, October 2011, p. 11; McKenzie and Partington, *Report to the AER: Risk, asset pricing models and WACC*, June 2013, p. 11; Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 64. McKenzie and business risk for the benchmark efficient entity will be very low for the following reasons:[1359]

- There are a number of inherent characteristics of an energy transportation network that lead to low systematic risk exposure. For example, operation of a natural monopoly and provision of an essential service with low price elasticity of demand.
- The structure of the regulatory regime insulates service providers from systematic risk. For example, this provides for revenue cap regulation, tariff variation mechanisms and cost pass through mechanisms. This also provides for tariff structures that include fixed charges and protection of sunk investment through rolling forward the regulatory asset base (RAB).

We consider the broad category of business risk can be disaggregated into further subcategories of risk. In their 2012 report to the AER, McKenzie and Partington disaggregated business risk into intrinsic (or economic) risk and operational risk.[1360] Intrinsic risk relates to how the business cycle impacts on a firm's sales and operational risk relates to a firm's operating leverage (that is, the proportion of fixed to variable costs). McKenzie and Partington considered that operational risk for the benchmark efficient entity would be above the market average, given the high proportion of fixed costs (relative to variable costs) for energy networks.[1361] However, the overall business risk would still be low because the benchmark efficient entity could mitigate the effect of this cost structure through the use of fixed charges. McKenzie and Partington also considered that intrinsic risk for the benchmark efficient entity would be very low because it is insulated from the business cycle for reasons described above (for example, the regulatory regime and low price elasticity of demand).[1362]

In their 2012 report, one of McKenzie and Partington's key conclusions was that the intrinsic risk of a firm is the 'primary, if not sole, driver of its systematic risk'.[1363] In their 2014 (and 2015) report, McKenzie and Partington reiterated this conclusion and cited a number of published academic articles to support their view.[1364] On the basis of this information, we consider the intrinsic business risk of a firm is the primary driver of its systematic risk, and that this intrinsic risk is low for the benchmark efficient entity (relative to the market average firm).

Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 11. Origin Energy, *Submission to NSW distribution network service providers regulatory proposals for 2014–19*, August 2014, p. 7.

1359 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 40–41. Also see: Frontier Economics, *Assessing risk for regulated energy networks*, July 2013; McKenzie and Partington, *Estimation of equity beta*, April 2012, p. 6.

1360 McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 5–6. See also: McKenzie and Partington, *Report to the AER: Risk, asset pricing models and WACC*, June 2013, p. 11.

1361 McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 7, 14.

1362 McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 6, 15.

1363 McKenzie and Partington, *Estimation of equity beta*, April 2012, p. 14.

1364 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 12; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 32.

D.1.2 Financial risk

Financial risk relates to the additional systematic risk exposure that arises from the debt holdings of a firm. The underlying principle is that, since payments to debt holders take precedence over payments to equity holders, the systematic risk exposure for equity holders (that is, the equity beta) increases as the firm issues more debt. It is generally accepted that the benchmark efficient entity has higher financial risk than the market average firm.[1365] The key characteristic causing this higher financial risk is the relatively high financial leverage (gearing) for the benchmark efficient entity (60 per cent) relative to the market average firm (roughly 30 to 35 per cent).

However, the exact relationship between financial risk and financial leverage is not straightforward. In their 2012 report, McKenzie and Partington discussed the limitations of various linear and nonlinear leverage formulae.[1366] They considered that, overall, increased financial leverage increases the financial and therefore systematic risk facing equity (that is, the equity beta). However, they cautioned against any claim that the exact nature of this relationship might be known. This suggests that the high financial leverage of the benchmark efficient entity (relative to the market average) does not necessarily result in an equivalently high exposure to financial risk. For instance, in their 2014 (and 2015) report, McKenzie and Partington noted that, for energy network businesses, the likelihood of bankruptcy as leverage increases is low (to the extent that the business is able to pass on borrowing costs to consumers).[1367] In their 2013 report, McKenzie and Partington also noted that, given the low default risk in regulated energy network businesses, the financial risk effects are 'unlikely to be substantive in normal market conditions'.[1368]

In its 2013 report, Frontier disaggregated financial risk (arising as a consequence of how the business's activities are funded) into five different subcategories.[1369] For each of the subcategories that contribute to financial risk, Frontier assessed the level of risk for regulated Australian energy network businesses relative to other businesses in the economy as:[1370]

- low risk—default risk, financial counterparty risk, and illiquidity risk (for large networks)
- medium risk—refinancing risk

1365 McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 7, 10; SFG, *Equity beta*, May 2014, pp. 17–18; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 60; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 42; SFG, *Equity beta report prepared for APT Petroleum Pipelines Ltd*, October 2011, p. 11.

1366 McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 7–13.

1367 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 11; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 31–32.

1368 McKenzie and Partington, *Report to the AER: Risk, asset pricing models and WACC*, June 2013, pp. 11–12.

1369 This report included both systematic and non-systematic risk, although only the former is relevant for the estimation of equity beta.

1370 Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 65.

- medium to high risk—interest rate reset risk, and illiquidity risk (for small networks).

Further, when the Frontier report assessed interest rate reset risk as 'medium to high', it did so on the basis that the regulated return on debt would continue to be set using an 'on the day' approach.[1371] Later in that report, Frontier acknowledges that our implementation of a trailing average approach would reduce interest rate reset risk.[1372]

On the basis of the information set out above, we consider that although the benchmark efficient entity has high financial leverage (relative to the market average firm), this does not necessarily imply it has an equivalently high exposure to financial risk. We consider McKenzie and Partington's 2014 (and 2015) report supports this position. We note McKenzie and Partington remain of the view that they expressed in 2012; that it is the intrinsic risk of the firm which is the key driver of systematic risk.[1373]

D.1.3 Overall systematic risk assessment

The conceptual assessment of equity beta relative to the market average is determined by the direction and relative magnitude of these two systematic risk factors: business risk and financial risk.

We consider the above assessment of business risk and financial risk for the benchmark efficient entity suggests that the intrinsic business risk of a firm is the main driver of its systematic risk. We expect the benchmark efficient entity to have low intrinsic risk exposure (relative to the market average). We also consider the high financial leverage of the benchmark efficient entity (relative to the market average) does not necessarily correspond to an equivalently high exposure to financial risk. Therefore, on the basis of this information, we consider there are reasonable conceptual grounds to expect the overall systematic risk for the benchmark efficient entity to be below that of the market average firm. This leads to our expectation that the equity beta of the benchmark efficient entity will be below 1.0.

This conclusion is supported by McKenzie and Partington in their 2012 conceptual assessment by:[1374]

> Taken together, the previous conceptual discussion clearly provides evidence to suggest that the theoretical beta of the benchmark firm is very low. While it is difficult to provide a point estimate of beta, based on these considerations, it is hard to think of an industry that is more insulated from the business cycle due to inelastic demand and a fixed component to their pricing structure. In this case, one would expect the beta to be among the lowest possible and this conclusion would apply equally irrespective as to whether the benchmark firm is a regulated energy network or a regulated gas transmission pipeline.

[1371] Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 64.

[1372] Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 74.

[1373] McKenzie, Partington, *Report to the AER, Part A: Return on equity,* October 2014, pp. 12–13; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 32.

[1374] McKenzie and Partington, *Estimation of equity beta*, April 2012, p. 15.

In their 2014 and (2015) report, McKenzie and Partington reviewed the available evidence and confirmed the conclusions made on their conceptual assessment of equity beta outlined in their 2012 report.[1375]

We have also received a number of stakeholder submissions in 2014 that suggest regulated energy network service providers face very low levels of systematic risk.[1376] Origin Energy (Origin) considered an efficient benchmark cost of capital for these firms is more comparable to a corporate bond rate than that of a company like Origin.[1377] The Public Interest Advocacy Centre (PIAC) and Consumer Challenge Panel (CCP) submitted that Australian energy network service providers face a more stable business environment than the market as a whole, and are seen as a 'safe haven' in periods where economic volatility is high.[1378] The Energy Markets Reform Forum (EMRF) also submitted that:[1379]

> publically listed networks consistently state to investors that one of benefits of investing in the networks are that they are offer stable long–term positive cash flows and are subject to a stable regulatory environment.

We received similar submissions in 2015.[1380] For example, Engineroom Consulting (on behalf of the Queensland Council of Social Service) submitted that electricity distribution businesses are 'low risk businesses relative to the overall market'.[1381] Origin also submitted that, for energy network businesses, increases in financial risk as leverage increases is relatively low. It submitted that this is largely because of the minimal risks in the current regulatory framework and the ability of the businesses to effectively pass on borrowing costs to consumers.[1382]

1375 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 11–12; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 31–32.

1376 Submissions in 2014 were on the proposals submitted as part of the NSW/ACT/Tas regulatory determination process.

1377 Origin, *Submission to NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 7.

1378 PIAC, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014,
p. 77; CCP, *Jam tomorrow? Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 14; CCP, *Jam tomorrow? – ACT version: Submission to ActewAGL's regulatory proposal for 2014–19*, August 2014, p. 10.

1379 EMRF, *Submission to Jemena Gas Network's access arrangement proposal for 2015–20*, August 2014, p. 86.

1380 Submissions in 2015 were on the proposals submitted as part of the Qld/SA electricity distribution regulatory determination process, and on the AER draft decisions and the revised proposals submitted as part of the NSW/ACT/Tas regulatory determination process. Submissions which consider Australian network service providers face low levels of risk were made by the CCIQ, EUAA, Alliance of Electricity Consumers, Cummings Economics, National Irrigators Council, SPA Consulting Engineers, Townsville Enterprise, Canegrowers, Canegrowers ISIS, Central Highlands Cotton Growers and Irrigators Association, Darling Downs Cotton Growers, ETU, Origin, QCOSS, Business SA, Central Irrigation Trust, COTA SA, SACOSS, SAFCA, UnitingCare, MEU, PIAC,

1381 QCOSS, Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20, 30 January 2015, p. 71.

1382 Origin, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 14.

These submissions indicate there is widespread consideration that regulated energy network firms (or service providers) operating within Australian face low overall levels of systematic risk.

Based on the available evidence, we consider there are reasonable conceptual grounds to expect that the equity beta for a benchmark efficient entity will be below 1.0.

However, in its 2014 reports for several service providers, SFG Consulting (SFG) has stated that it is not possible to conceptualise which component of systematic risk dominates the other. It considers there are a number of problems with our conceptual analysis, including:[1383]

- It is an empirical (not conceptual) analysis, as McKenzie and Partington consider empirical literature to support their conclusions. SFG considered an empirical analysis cannot be used to form a conceptual view.
- It implies the effect of leverage on equity beta is weaker than (and inconsistent with) that implied by the formula the AER uses to de-lever and re-lever its raw equity beta estimates.
- It is wrong, because the empirical evidence and expert reports relied upon by the AER have been misinterpreted.

We consider that SFG's distinction between empirical and conceptual analysis is a matter of labelling that does not affect the substantive content of the analysis. We note our conceptual analysis is not restricted to pure theoretical analysis. It is analysis based on a concept to be explored, rather than a methodology to provide or determine best outputs (in this case, parameter estimates). Findings from different information sources (including academic empirical literature) can be used to explore the concept and draw conclusions. Moreover, in their 2014 (and 2015) report, McKenzie and Partington reiterated the conceptual conclusions made in their 2012 report and specifically stated that they 'provide a clear conceptual analysis' of the logic underlying their views.[1384]

In relation to SFG's view on the effect of leverage on equity beta, we consider the exact nature of the relationship between financial leverage and equity beta is not straightforward and cannot be known with certainty. We use the Brealey–Myers formula to de-lever and re-lever raw empirical estimates to a benchmark gearing level (60 per cent), specified as follows:

[1383] SFG, *Equity beta*, May 2014, p. 18; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 60. SFG summarises and directly references SFG's 2014 equity beta report in SFG, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon and Transend*, 27 May 2014, pp. 84–85 (SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014). Therefore, any references we make to SFG, *Equity beta*, May 2014 also apply to the service providers who submitted SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014 (including SAPN).

[1384] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 12; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 32.

$$\beta_E = \beta_A \left(1 + \frac{D}{E}\right)$$

where

- β_e is the equity beta
- β_a is the un-levered asset beta, and
- $\frac{D}{E}$ is the debt to equity ratio.

We adjust the raw (that is, not de-levered and re-levered) empirical equity beta estimates for leverage because it improves the alignment of our estimates with the benchmark efficient entity. However, we have regard to both raw and leverage adjusted (or re-levered) equity beta estimates because we acknowledge the uncertainty inherent in assuming a particular relationship between financial leverage and equity beta. In their 2014 (and 2015) report, McKenzie and Partington noted the above formula assumes a debt beta of zero, which is an incorrect assumption.[1385] Introducing a positive debt beta would result in lower re-levered equity beta estimates when the benchmark gearing is higher than the observed (or actual) gearing of the firm or industry. They also noted the relationship between financial leverage and equity beta becomes more complicated when taxes and other relevant factors are considered, stating:[1386]

> In short, there are so many twists and turns that the de-leveraging and re-levering exercise can take you to a range of different destinations depending on what you assume.

Therefore, we acknowledge this formula may not necessarily produce an exact representation of the circumstances of a particular business. However, it is important to note that the industry average gearing is similar to our benchmark gearing of 60 per cent. This means the choice of whether or not to adjust raw equity beta estimates for leverage is unlikely to be material on the average of individual firm estimates.

In relation to SFG's views on our interpretation of empirical evidence, we do not consider the empirical evidence referred to by McKenzie and Partington in their 2012 report has been misinterpreted. SFG referred to the following two sources of empirical information:[1387]

1385 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 10; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 30.

1386 McKenzie, Partington, *Estimation of equity beta*, April 2012, p. 11; McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 11; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 31.

1387 SFG, *Equity beta*, May 2014, pp. 19–20; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 61–62. For the Damodaran data refer to the 'Updated data' link and the archived '*Levered and Unlevered Betas by Industry*' at http://people.stern.nyu.edu/adamodar/. McKenzie and Partington refer to the 2012 update values, which uses end of 2011 market price data. Also see: Schlueter and Sievers, *Determinants of market beta: the impacts of firm-specific accounting figures and market conditions*, forthcoming in Review of Quantitative Finance and Accounting, 2014.

- US industry beta tables presented by Aswath Damodaran (Damodaran), Professor of Finance at New York University
- a forthcoming journal article (previously a working paper) by Tobias Schlueter and Soenke Sievers (Schlueter and Sievers).

McKenzie and Partington used the Damodaran data to show that equity betas for water, gas and electricity utilities are among the lowest of all industries analysed, while the debt to equity ratios for these industries are among the highest (as at the end of 2011).[1388] They did not de-lever and re-lever the observed equity beta estimates and did not assess the magnitude of the estimates. McKenzie and Partington used this dataset to perform a simple comparative exercise and highlight the basic point that 'utility betas are likely to be amongst the lowest of all industries'.[1389]

We consider SFG's analysis of the Damodaran data is a significant departure from the intention of McKenzie and Partington's analysis. SFG adjusted the raw US equity beta estimates to a benchmark gearing of 60 per cent and asserted the Damodaran data supports an equity beta 'well above 1' for energy utilities.[1390] In addition to this mischaracterisation of McKenzie and Partington's analysis, we consider there are a number of problems with SFG's analysis:

- Its re-levered equity beta estimates are incorrect. The correctly adjusted estimates (to a gearing level of 60 per cent) are set out in Table 3-45, using the Brealey–Myers formula (specified above).
- Adjusting these raw equity beta estimates for leverage may introduce material error. As discussed above, the Brealey–Myers formula may not be a precise representation of the relationship between financial leverage and equity beta. However, the Australian energy firms in our comparator set have gearing levels that are clustered around the benchmark level, and as such our re-levered estimates (on average) do not differ materially from the raw estimates. This is not the case for the utility industries in Damodaran's dataset because they have average industry gearing levels well below our benchmark level of gearing (60 per cent, which equates to a debt–to–equity ratio of 150 per cent). If the Brealey–Myers formula is inaccurate, then these re-levered US equity beta estimates (to 60 per cent gearing) are likely to contain material error. We consider these figures clearly demonstrate that the observed (or raw) equity betas for US utilities are well below the beta of the market (which is 1.0 by definition).

1388 McKenzie and Partington, *Estimation of equity beta*, April 2012, p. 15.

1389 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 11; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 31.

1390 SFG, *Equity beta*, May 2014, p. 19; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 61.

Table 3-45 Damodaran's raw and re-levered US equity beta estimates by industry (as at the end of 2011)

Industry	Observed (or raw) equity beta	Observed D/E (%)	Re-levered equity beta (D/E = 150%)
Water utility	0.66	81	0.91
Natural gas utility	0.66	67	0.99
Electric utility (east)	0.70	66	1.05
Electric utility (west)	0.75	85	1.02
Electric utility (central)	0.75	86	1.01

Source: AER analysis; Damodaran, *Updated data: The Data page*, *Levered and Unlevered Betas by Industry*, Stern school of Business New York University, last updated January 2014, viewed 6 November 2014, see link: <http://people.stern.nyu.edu/adamodar/>

Note: 'Natural gas utility' and 'water utility' have the lowest observed equity betas (0.66) out of all the industries presented in Damodaran's table. 'Public/private equity' has the highest observed equity beta, at 2.18, and 'Engineering and const.' has the median observed equity beta, at 1.22.

We consider the US energy utility firms are likely to carry greater risk than Australian energy network firms. This is because they are subject to different regulatory protections and many are vertically integrated.[1391] That is, they perform other activities in addition to energy distribution and transmission services, such as energy retail and distribution services. These other activities are often subject to greater competition and carry greater systematic risk. Therefore, we consider the US utility equity beta estimates are likely to be higher than those of Australian energy network firms.[1392] Nevertheless, as noted above, Damodaran's estimates show that US utilities still have observed (or raw) equity beta estimates well below 1.0 and among the lowest of all US industries.

In regards to the forthcoming Schlueter and Sievers article, we are satisfied that it suggests intrinsic business risk is the main component of equity beta. SFG consider the evidence from the Schlueter and Sievers article does not apply to utilities and is

1391 CEG, *Equity beta from US companies*, June 2013, p. 20; AER, *Equity beta issues paper*, October 2013, p. 34.

1392 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 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.

irrelevant because it is based on accounting data.[1393] We consider SFG has mischaracterised the evidence in the Schlueter and Sievers article. In their 2014 and (2015) report, McKenzie and Partington made the following points:[1394]

- The Schlueter and Sievers article is based on accounting data, but this has no impact on the conclusions drawn. In fact, the authors motivate their article by discussing general academic literature in this area.
- The evidence from the Schlueter and Sievers article is applicable to utilities. The Table 1 referred to by SFG is a table of summary statistics and the determinants of equity beta are not presented in this table. The article is a cross–sectional study across all industries. However, Schlueter and Sievers attempt to provide individual industry information by performing a robustness test that includes industry indicator variables in all their regressions. This robustness test confirms their results, indicating that intrinsic risk is the main component of equity beta for all industries.

SFG also submitted we have misinterpreted the intention of the 2013 Frontier report.[1395] SFG stated the Guideline material appears to suggest that leverage affects equity beta via the five financial risks set out in the 2013 Frontier report. This is a mischaracterisation of our view. We do not consider that leverage affects equity beta via the five financial risks set out in the 2013 Frontier report.[1396] Further, we did not make this claim in any of the Guideline documents. In the Guideline appendices, we considered the exact relationship between financial risk and financial leverage is not straightforward, and we continue to maintain this view.[1397]

In its 2015 report for several service providers, SFG again disagreed with our conceptual analysis. It submitted that:[1398]

1393 SFG, *Equity beta*, May 2014, pp. 19–20; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 61–62.

1394 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 12; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 32.

1395 SFG, *Equity beta*, May 2014, pp. 20–21; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 62–63.

1396 Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 65.

1397 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 41.

1398 SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 41–45 (appendix 3). SFG directly references SFG's 2015 beta and Black CAPM report in SFG, *The required return on equity for the benchmark efficient entity: Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, APA, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, 13 February 2015, p. 19 (SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015) and SFG, *The required return on equity for the benchmark efficient entity: Report for Ausgrid, Endeavour Energy and Essential Energy*, 12 March 2015, p. 19 (SFG, *The required return on equity for the benchmark efficient entity*, 12 March 2015). Therefore, any references we make to SFG, *Beta and the Black capital asset pricing model*, 13 February 2015 also apply to the service providers who submitted SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015 and SFG, *The required return on equity for the benchmark efficient entity*, 12 March 2015. Also, any references we make to SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015 in this appendix applies to SFG, *The required return on equity for the benchmark efficient entity*, 12 March 2015, as the reports are very similar.

- Leverage is a more accurate term than financial risk because the term financial risk is subject to misinterpretation and equity beta depends directly on leverage. What the AER calls financial risk is actually a component of business risk with a 'financial flavour'.
- If the benchmark efficient entity has an equity beta less than 1.0, then, according to the Brealey–Myers formula, its business risk would have to be less than 0.4. There is no conceptual way to determine if this is the case.
- It continues to consider the empirical evidence and expert reports we rely upon have been misinterpreted.

We disagree with SFG's views. We consider SFG has misunderstood the point of our conceptual analysis by focussing on formulae (particularly the Brealey–Myers formula) that directly relate financial leverage to equity beta. We consider a more holistic view of systematic risk. We also consider that, irrespective of the conceptual debate, the Australian empirical evidence supports an equity beta below 1.0 for the benchmark efficient entity (see section D.2).

Equity beta measures the systematic risk of a firm relative to the market as a whole. We consider:

- systematic risk can be broken down into business risk and financial risk
- financial risk relates to the indebtedness, or financial leverage, of a firm[1399]
- there are risks associated with incurring debt, such as default risk, financial counterparty risk, illiquidity risk, refinancing risk, interest rate reset risk (as mentioned in Frontier's 2013 report)[1400]
- these risks contribute to the financial risk of a firm.

Therefore, we do not agree with SFG's submission that leverage is a 'more accurate term' than financial risk.[1401] We do not consider the two are equivalent concepts, or that financial risk is a component of business risk. We consider financial risk increases as financial leverage increases, but we do not know the exact nature of this relationship. McKenzie and Partington agreed with our view.[1402] Our overall assessment of business risk and financial risk leads us to our expectation that the systematic risk of the benchmark efficient entity is less than the market average firm. Our reasoning for this view is explained in detail above and supported by McKenzie and Partington.[1403]

We also continue to disagree with SFG on the empirical evidence referred to by McKenzie and Partington in their 2012 report. We consider McKenzie and Partington have not misinterpreted this evidence for the reasons set out above. We consider:

[1399] McKenzie and Partington, *Estimation of equity beta*, April 2012, p. 6.
[1400] Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 65.
[1401] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 41.
[1402] McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 8–10.
[1403] McKenzie and Partington, *Estimation of equity beta*, April 2012, p. 15.

- SFG has again mischaracterised the intention of McKenzie and Partington's analysis in relation to the Damodaran data (which we describe above). SFG has also incorrectly stated we show that the re-levered Damodaran equity beta estimates suggest the benchmark efficient entity would have a beta close to the market average firm.[1404] We show the re-levered estimates because we consider SFG presented incorrect re-levered estimates in its 2014 reports.[1405]
- The evidence from the Schlueter and Sievers article does apply to utilities because the article is a cross–sectional study across all industries.[1406] Schlueter and Sievers' robustness test confirms their results. These results indicate that intrinsic risk is the main component of equity beta for all industries. We do not consider that Schlueter and Sievers' results are less meaningful because they use two sentences to explain their robustness test.[1407]

Disruptive technologies and regulatory risk

ActewAGL and SA Power Networks (SAPN) have also submitted that our conceptual analysis is incorrect because we have not accounted for the recent risks arising from disruptive technologies.[1408] They submitted that developments in distributed generation, smart technology and power storage may allow consumers to disconnect from the grid, which could threaten the role of energy networks. ActewAGL and SAPN referenced a number of reports describing various disruptive technologies and their impact on the energy sector. We also received a number of submissions from service providers that supported this aspect of SAPN's proposal.[1409]

We recognise disruptive technologies such as solar panels, smart technology and power storage may be changing the way consumers produce and consume electricity. We also recognise this could have an effect on how consumers make use of network infrastructure and may increase some risks faced by service providers. However, in determining whether this increased risk needs to be accounted for in the equity beta (or the rate of return generally), we must consider the following questions:

- Is the risk systematic?

1404 SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 45.

1405 We discuss this above

1406 In its 2014 reports, SFG also submitted that the Schlueter and Sievers article is irrelevant because it uses accounting data (see: SFG, *Equity beta*, May 2014, pp. 19–20; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 62). We do not agree with this view. McKenzie and Partington stated ' the fact that Schlueter and Sievers (2014) is based on accounting data is irrelevant…In fact, Schlueter and Sievers (2014) motivate their paper by drawing on the general literature '. See: McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 12; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 32.

1407 SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 45.

1408 ActewAGL, *Revised regulatory proposal*, January 2015, pp. 451–456; SAPN, *Regulatory proposal*, October 2014, pp. 306–309.

1409 We received very similar submissions from CitiPower and Powercor, Jemena Limited, SAPN, United Energy and Australian Gas Networks. See: Citipower and Powercor, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 3.

- If so, could the risk already be accounted for in equity beta?

We do not consider the risk arising from disruptive technologies can be reasonably classified as systematic risk. In his 2015 report, Partington supports this view.[1410] Systematic risk is risk which affects the market as a whole (such as macroeconomic conditions and interest rate risk). We consider developments in disruptive technologies such as distributed generation, smart technology and power storage are unlikely to have significant effects outside the energy sector. Moreover, the reports and evidence submitted by the service providers do not refer to any effects of disruptive technologies on the systematic risk of Australian network service providers.

Even if the risk arising from disruptive technologies has increased the systematic risk of the benchmark efficient entity, we consider this will be captured in our empirical equity beta estimates to the extent that investors are aware of the risk.[1411] The service providers' submissions make it clear that the risks arising from disruptive technologies in the energy sector are already widely recognised. For example, ActewAGL submitted that UBS has been conducting research into solar PV, battery storage and electric vehicles for over two years.[1412] We recognise our empirical equity beta estimates are measured over a relatively long estimation period. However, we also consider estimates measured over the last five years. This is consistent with ActewAGL's submission that disruptive technologies have increased risk for Australian energy distribution businesses over the last five years.[1413]

Further, we recognise the development of disruptive technologies in the Australian energy sector may create some non-systematic risk to the cash flows of energy network businesses. We consider these can be more appropriately compensated through regulated cash flows (such as accelerated depreciation of assets). Partington agreed with this view, stating that:[1414]

> The appropriate way to adjust to for disruptive technology is therefore to adjust the cash flow. To the extent that the result of disruptive technology is stranded assets, then the effective economic life of the asset is reduced and/or its residual value is less than originally assumed. Consequently, one way to allow for the impact on cash flow is to increase the regulatory depreciation allowance.

SAPN questions the benefit of utilising such cash flow measures to reduce risk because these measures assume network service providers have a large customer base that can absorb the increased costs. It considers these measures will not be

[1410] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 77–78.

[1411] Origin Energy submitted a similar view. It stated that 'if the consequences of the environment risk raised by SAPN were a significant and quantifiable threat, the market would have already incorporated these risks into the pricing of publicly listed network stocks'. See: Origin, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2015, p. 13

[1412] ActewAGL, *Revised regulatory proposal*, January 2015, p. 453.

[1413] ActewAGL, *Revised regulatory proposal*, January 2015, p. 451.

[1414] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 77.

appropriate in a situation where 'an endless spiral of disconnections commences'.[1415] However, increasing the allowed rate of return (through equity beta) also increases costs to consumers, and as such we consider the same assumption applies.[1416]

ActewAGL also submitted that there has been a 'step change' increase in regulatory risk which requires compensation through an increase in the equity beta.[1417] We are not satisfied that ActewAGL has provided sufficient evidence to support its conclusion. Further, we are not satisfied ActewAGL has provided sufficient evidence to establish that any such risk is systematic. We consider our approach to estimating the equity beta sufficiently captures the systematic risk of the benchmark efficient entity.

Comparative systematic risks of gas and electricity networks

We consider the systematic risks between gas, electricity, transmission and distribution networks are sufficiently similar as to justify one benchmark. We considered this matter in detail during the Guideline development process, and this material remains relevant.[1418]

Jemena Gas Networks (JGN) submitted that gas distribution businesses are more risk exposed than electricity network businesses. Therefore, it considers applying an equity beta for a single benchmark efficient entity is likely to be highly conservative.[1419]

JGN set out a number of risks where it considered gas networks were more risk exposed. These are:[1420]

- demand risk
- sensitivity to other risk factors (that is, other factors that can influence demand)
- fuel of choice risk (consumers can substitute away from gas)
- wholesale price risk (wholesale gas prices are expected to rise, increasing demand uncertainty)
- supply shortfall risk (potential for supply shortfalls which increases demand uncertainty).

[1415] SAPN, *Regulatory proposal*, October 2014, p. 308.

[1416] The Central Irrigation Trust submitted a similar view. It believes SAPN's proposed WACC is too high and that ' Decreasing prices we believe may stimulate demand benefiting both customers and SA Power Networks. In fact reducing prices and increasing demand may halt the disconnection risk outlined in chapter 26 of the proposal'. See: Central Irrigation Trust, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2015, p. 6.

[1417] ActewAGL, *Revised regulatory proposal*, January 2015, pp. 456–457.

[1418] AER, *Explanatory statement: Rate of return guideline (appendices)*, December 2013, pp. 36–38; AER, *Explanatory statement: Draft rate of return guideline*, August 2013, pp. 42–46.

[1419] JGN, *Revised access arrangement proposal—Appendix 7.1: Return on equity response*, February 2015, pp. 21–22.

[1420] JGN, *Revised access arrangement proposal—Appendix 7.1: Return on equity response*, February 2015, pp. 21–22.

JGN also submitted a report by HoustonKemp Economists (HoustonKemp), which discussed competition from alternative fuels in detail.[1421]

We disagree with JGN's view. We will respond to this issue in detail in our final decision for JGN. However, we note the following:

- We are not satisfied JGN has provided sufficient evidence to establish that the risks described are systematic risks.
- Both gas and electricity service providers face limited competition risk by virtue of being regulated natural monopolies. Generally, competition risks for regulated networks are low. Such networks are usually regulated because they are natural monopolies.
- We consider the regulatory framework for gas and electricity service providers are similar. The main difference is in the control mechanism that applies to their regulated services. Gas service providers are subject to a price cap, whereas electricity service providers are subject to a revenue cap. However, these are reset approximately every five years and gas service providers can mitigate the risk of forecast error by restructuring tariffs to offset demand volatility.

Based on the available evidence, including the recent expert report from McKenzie and Partington, we consider there are reasonable conceptual grounds to expect the equity beta of a benchmark efficient entity will be below 1.0, which applies equally to gas and electricity network service providers. However, we recognise the limitations of this approach. The conceptual analysis does not indicate the magnitude of the difference between the benchmark efficient entity and the market average (1.0). Therefore, we use our conceptual analysis as a cross check on the results of our empirical analysis, although we note we consider the empirical analysis alone is sufficient to support an equity beta point estimate of 0.7.

D.2 Australian empirical analysis

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 step two of section 3.4.1, empirical estimates using a comparator set of listed Australian energy network firms are the main determinant of our equity beta estimate for a benchmark efficient entity.

For this analysis we commissioned an expert report from Professor Olan Henry (Henry), which provided an update on his 2009 econometric analysis of equity beta.[1422] 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

[1421] HoustonKemp, *Implications for Jemena Gas Networks (NSW) of increasing competition in the consumer energy market: A report for Jemena Gas Networks*, 27 February 2015 (HoustonKemp, *Implications for Jemena Gas Networks (NSW) of increasing competition in the consumer energy market*, 27 February 2015).

[1422] Henry, *Estimating β*, April 2009; Henry, *Estimating β: An update*, April 2014.

econometric techniques, comparator sets and time periods. From 2002 to 2014, these empirical studies have presented equity beta estimates that converge on the range of 0.4 to 0.7 (see Table 3-49). 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.[1423] This report applied a number of regression permutations based on different econometric techniques, comparator sets and time periods. The resulting equity beta estimates consistently fall within the range of 0.4 to 0.7, with most estimates clustered around 0.5. These results are consistent with the pool of other studies considered and are based on a larger, more recent dataset.

We are satisfied our empirical equity beta range is reliable and reflective of the benchmark efficient entity. The remainder of this subsection is set out as follows:

- discussion of our comparator set of Australian energy network firms
- discussion of our methodological choices
- discussion of the empirical evidence from Henry's 2014 report
- discussion of other empirical studies.

D.2.1 Comparator set selection

We define the benchmark efficient entity as 'a pure play, regulated energy network business operating within Australia'.[1424] We would, ideally, use firms that share all or most of the key characteristics of the 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 the benchmark efficient entity, and these remain relevant. They are ASX listed firms that provide regulated electricity and/or gas network services operating within Australia. Table 3-46 sets out the details of these nine firms. For its prevailing specification of the SLCAPM, TransGrid's consultant, NERA Economic Consulting (NERA), based its equity beta estimate on this comparator set of Australian energy network firms.[1425]

[1423] NER, cll. 6A.6.2(g) and 6.5.2(g); NGR, rule 87(7). Note: Grant Samuel and Associates' 2014 independent expert report for Envestra use more recent data than Henry's 2014 report. However, this report is not specific to equity beta estimation, and as such there is no detailed explanation of their methodology or results.

[1424] AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 8, 33–36, 44–45.

[1425] NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014, p. 79 (NERA, *Return on capital of a regulated electricity network*, May 2014). We note that NERA did not rely exclusively on this specification of the SLCAPM (and equity beta) as it used a multiple model approach to estimate the return on equity. TransGrid submitted that it maintained its return on equity position from its revenue proposal in its revised

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 firm.[1426] 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).[1427] We note that Envestra Ltd was delisted on 17 October 2014.[1428]

Table 3-46 Listed entities providing regulated electricity and gas network services operating in Australia

Firm (symbol)	Time/trading period	Sectors
AGL Energy Limited (AGK)	January 1990 – October 2006	Electricity Gas
Alinta (AAN)	October 2000 – August 2007	Gas
APA Group (APA)	June 2000 – present	Gas Minority interest in energy
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[1429] – present	Electricity Gas
SP AusNet (SPN)[1430]	December 2005 – present	Electricity

revenue proposal (subject to minor additions and changes). As such, the expert reports submitted under TransGrid's proposal (including NERA's 2014 report) are directly relevant to TransGrid's revised proposal.

1426 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.

1427 Henry, *Estimating β: An update*, April 2014, p. 12.

1428 See: http://www.asx.com.au/asx/statistics/announcements.do?by=asxCode&asxCode=ENV&timeframe=Y&year=2014.

1429 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.

1430 Since the publication of the Guideline, SP AusNet changed its company name to AusNet Services. As of 5 August 2014, this change was reflected in the ASX and the company code was changed from SPN to AST. See: http://www.asx.com.au/prices/company-name-and-asx-code-changes-2014.htm.

Firm (symbol)	Time/trading period	Sectors
		Gas

Source: AER analysis; Bloomberg; AER, *Review of the WACC parameters: Final decision*, May 2009, p. 255.

While we consider the firms in Table 3-46 are comparable to the benchmark efficient entity, they also provide some non–regulated electricity and/or gas services. Examples of this include:

- Approximately 23 per cent of APA Group's revenue in the 2014 financial year (excluding pass–through revenue) was subject to prices determined under full regulation. APA generates most of the remaining 77 per cent of its revenue from contracts which have set terms, including negotiated pricing for the life of the contract.[1431]
- DUET Group's assets receive some unregulated revenue—Dampier Bunbury Pipeline (3 per cent unregulated), United Energy (8 per cent unregulated), Multinet Gas (7 per cent unregulated) in the 2014 financial year.[1432]
- Approximately 87 per cent of SP AusNet's (now AusNet Services) revenues are regulated, as at 30 May 2014.[1433]
- 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.[1434]
- 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.[1435]

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

1431 APA Group, *Innovating today transforming tomorrow: APA Group annual report 2014*, p. 2.

1432 DUET Group, *Annual report 2014*, p. 5.

1433 SP AusNet, *Statutory annual report 2014*, June 2014, p. 25.

1434 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.

1435 GasNet, *Infrastructure for generations: GasNet Australia Group annual report 2005*, p. 29.

comparators are reasonable.[1436] 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 for a benchmark efficient entity because unregulated activities are likely to face greater systematic risk.[1437]

International comparators

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. 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 benchmark efficient entity definition because they do not operate within Australia.
- We discuss equity beta estimates in the context of our foundation model, which is the domestic SLCAPM.[1438] 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 CAPM.
- 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. It is difficult to assign quantitative impacts to these qualitative factors.
- Equity beta estimates from international comparators are measured with respect to the market portfolio of their home market.[1439] 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.[1440]
- 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.[1441] They engage in energy generation, wholesale and retail of energy, as well as other activities distinct from

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1436 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.

1437 Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, pp. 15, 69, 77, 86.

1438 We implement the SLCAPM 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.

1439 This is the case unless the equity betas are estimated using an international CAPM framework.

1440 This is supported by our consultant John Handley in his 2014 report to the AER. See: Handley, *Advice on the return on equity*, October 2014, pp. 23–24.

1441 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.

energy distribution and transmission. Some of the firms even engage in telecommunications, real estate development and manufacturing activities.[1442] These activities are very different from the 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.[1443]

- 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 benchmark efficient entity.

These factors are discussed in more detail in the Guideline and 2009 WACC review.[1444] 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 proposals submitted by the relevant service providers present us with such evidence. Our reasoning is discussed in detail below.

In its 2014 reports for several service providers, SFG recognised that international energy network firms are less comparable to the benchmark efficient entity than Australian energy network firms. However, it also considered our comparator set of Australian energy network firms was too small and produced unreliable equity beta estimates.[1445]

SFG considered there are two key issues in determining whether international energy firms should be included in the comparator set for our empirical analysis:

1. whether the international energy firms are sufficiently comparable to the benchmark efficient entity to be included in the analysis
2. whether including international energy firms in the domestic comparator set increases the reliability of the equity beta estimates.

In analysing these issues, SFG made the following conclusions:[1446]

[1442] CEG, *Information on equity beta from US companies*, June 2013, pp. 47–68.

[1443] 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 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.

[1444] 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.

[1445] SFG, *Equity beta*, May 2014, p. 2; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 82.

[1446] SFG, *Equity beta*, May 2014, pp. 31–34, 40; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 71–74, 82.

1. The 56 US energy firms identified by CEG during the Guideline process are sufficiently comparable to the benchmark efficient entity. Therefore, they should be included in our comparator set for empirical analysis, albeit with less weight than the domestic comparators.
2. Including US energy firms in the comparator set for empirical analysis increases the reliability of the equity beta estimates.

We considered SFG's first point in the Guideline process. At that time we did not consider CEG produced satisfactory evidence that the suggested sample of US energy firms represented sufficiently close comparators to the benchmark efficient entity. Our detailed reasoning for this is in the Guideline material.[1447] In its 2014 reports, SFG has again submitted that we should include the sample of 56 US energy firms in our comparator set of Australian energy network firms.[1448] It considered our reasoning for why international energy firms are not sufficiently comparable to the benchmark efficient entity is incorrect on several grounds. Hence, we have re-evaluated this material.

SFG has questioned our consideration that vertically integrated energy network firms are not closely comparable to the benchmark efficient entity and are likely to have a higher equity beta than pure energy network firms. SFG submitted that in a 2010 report to the ACCC, Frontier recommended a lower equity beta for more vertically integrated businesses.[1449] However, this report compared Victoria's rural water sector with the energy sector, considering the rural water sector to be more vertically integrated. Accordingly, this report did not provide us with information on the equity beta of pure play energy network firms relative to vertically integrated energy network firms. Therefore, we maintain our view that vertically integrated energy network firms are likely to overestimate the equity beta for the benchmark efficient entity. Our reasons for this are discussed in detail in the Guideline material.[1450]

SFG has also questioned our consideration that geography and weather may influence the equity beta of a similar business operating in different countries.[1451] It submitted that the climate and geography also differ within Australia, and by this logic we would have to separate the firms in our Australian comparator set. We recognise that climate and geography do differ within Australia. However, we consider SFG's selection of one

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[1447] AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 61–63. AER, *Equity beta issues paper*, October 2013, pp. 33–34.

[1448] SFG, *Equity beta*, May 2014, p. 40; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 82. In its 2014 report, CEG also submitted we should include 56 US energy firms in our domestic comparator set (see: CEG, *WACC estimates: A report for NSW DNSPs*, May 2014, pp. 7–10 (CEG, *WACC estimates*, May 2014)). It submitted very similar views to SFG and used SFG's preferred equity beta estimate. Therefore, the discussion in this section also applies to the service providers who submitted CEG's 2014 report.

[1449] SFG, *Equity beta*, May 2014, p. 34; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 74.

[1450] AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 62–64. AER, *Equity beta issues paper*, October 2013, pp. 33–34.

[1451] SFG, *Equity beta*, May 2014, p. 33; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 73.

of our examples of potential differences between domestic and international comparators misses the broader issue we are considering. That issue is that international energy network firms operate in different operating environments to Australian energy network firms. The identification of one difference between Australian energy network firms does not address this.

We are not suggesting our comparator firms face identical levels of systematic risk and are perfect comparators to the benchmark efficient entity. We consider they are reasonable comparators to the benchmark efficient entity, given the set of listed firms available to choose from. However, we also consider that they are more reasonable comparators than international energy network firms. International energy network firms are less reflective of the benchmark efficient entity for a number of reasons, including different operating environments. International operating environments can differ from domestic operating environments in a number of respects, from the regulatory framework the energy network firm is operating under, to the climate and geography they are exposed to. These differences can affect equity betas though the covariance of an energy firm's returns with the return of the applicable market portfolio.

This point leads to our consideration that under the domestic SLCAPM, equity beta estimates of international energy firms are measured with respect to the market portfolio of their home market. We consider this market portfolio will be different to the Australian market portfolio, and may be exposed to different systematic risks. As discussed in the Guideline, we consider this could be important in practice as well as theory. For example, the Australian market portfolio may exhibit a high systematic risk relative to other countries such as the US (due to a potentially larger proportion of mining stocks). If this is the case, international comparators are likely to produce upwardly biased equity beta estimates when used in an Australian context.[1452] In response to this view, SFG submitted the market portfolio always has an equity beta of 1.0 by definition, regardless of which country is being considered.[1453] It also considered that markets are not segmented by country, and domestic investors can buy stocks from other countries (including mining stocks). We do not agree with SFG's submission for the following reasons:

- While investors can buy stocks from different countries, we estimate equity beta in the context of the Australian domestic SLCAPM. We define the market for the SLCAPM as the domestic market, with a presence of foreign investors. Under this domestic SLCAPM, we consider Australian and international equity betas should be estimated separately using an appropriate proxy for the market portfolio of each country. SFG does this itself; it chooses the All Ordinaries accumulation index for the Australian market and the S&P 1500 for the US market.[1454] These stock market

[1452] AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 60.

[1453] SFG, *Equity beta*, May 2014, pp. 33–34; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 73–74.

[1454] SFG, *Regression-based estimates of risk parameters*, June 2013, pp. 9–10. This is the original report that sets out the data, methodology and results for SFG's preferred regression based estimate of equity beta (0.82). It is indices contain different portfolios of stocks, which indicate the market portfolios of different countries can differ in composition and systematic risk.

- The different compositions of market portfolios in different countries has a direct effect on the measurement of beta. This is because the equity beta measures the sensitivity of an asset or business's returns to movements in the applicable market portfolio's returns.[1455] It is the covariance of an asset's returns with the market portfolio returns ($cov(r_i, r_m)$), relative to the variance of the market portfolio returns ($var(r_m)$), and its formula is set out below:[1456]

  $$\beta_i = \frac{cov(r_i, r_m)}{var(r_m)}$$

  where

  - r_i is the return on asset or business *i*
  - r_m is the return on the market portfolio.

  Any given market portfolio has an equity beta of 1.0.[1457] This is a statement of relative risk—the contribution of the market portfolio to the market portfolio risk is 1.0. However different market portfolios can have different levels of systematic risk. In particular different market portfolios based on equity market indexes from different countries can have different levels of systematic risk, as measured by the variance of that market portfolio's returns.

  Equity beta is a relative measure and is tied to the market portfolio that is used. This means that the equity beta of a given asset (or industry) will be expected to be affected by the market portfolio used. Different market portfolios for different countries can be expected to differ in both:

  - the variance of the market portfolio return
  - the covariance of any given asset’s returns with the market portfolio return.

  We consider this makes a direct comparison of equity betas from different countries estimated against different domestic market proxies of reduced value.

- Handley added to these views in his 2014 report. He considered comparing domestic equity betas with international equity betas is like comparing 'apples and

referred to in: SFG, *Equity beta*, May 2014, pp. 40–41; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 82; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 29.

1455 Our foundation model is the domestic SLCAPM, and as such the appropriate market portfolio is based on the Australian market. McKenzie and Partington, *Risk, asset pricing models and WACC*, June 2013, p. 21.

1456 The SLCAPM is an expected returns model. Therefore, the equity beta is, in theory, based on expected returns. However, when estimating equity beta, historical returns are used. See: Peirson, Brown, Easton, Howard, Pinder, *Business Finance*, McGraw-Hill Australia: Tenth edition, 2009, pp. 186, 195.

1457 This is because the covariance of the market portfolio’s returns with itself is in fact equal to the variance of the market portfolio’s return. So both the numerator and denominator in the beta equation become equal, giving a beta of 1.0.

oranges' because they are measured relative to different domestic markets.[1458] He stated:[1459]

> 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.

Handley considered it is not valid to directly compare the magnitudes of Australian and international equity betas in the absence of a model that allows for such a comparison.[1460] He considered that any comparison of Australian and international equity betas would also need to account for currency risk, as the returns in different markets are expressed in different currencies.

- We also note that the use of equity betas estimated relative to the Australian market is consistent with our estimate of the Australian market risk premium (MRP) and risk free rate, which we use to implement the domestic SLCAPM in the Australian context.

Based on the available evidence, and after considering SFG's submissions, we maintain our view from the Guideline. We do not consider SFG has provided satisfactory evidence that the suggested sample of 56 US energy firms are sufficiently comparable to the benchmark efficient entity. Handley supports this view.[1461]

We now turn to SFG's second point that a larger comparator set of US and Australian energy network firms increases the reliability of the equity beta estimates.[1462] SFG submitted that equity beta estimates based only on a small sample of Australian comparators are inherently unreliable. It considers having a larger comparator set in itself increases the statistical reliability of equity beta estimates.

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. SFG measures reliability by considering the dispersion of equity beta estimates across samples of comparator firms and over time.[1463] It finds that the individual equity beta estimates from our Australian comparator set are widely dispersed and this dispersion decreases as the comparator set increases.[1464] However, a larger dataset is not an end in itself. Decreasing the dispersion of estimates by increasing the size of the

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1458 Handley, *Advice on the return on equity*, October 2014, p. 23.

1459 Handley, *Advice on the return on equity*, October 2014, p. 23.

1460 That is, unless an international asset pricing model is used. International asset pricing models can measure equity betas relative to the same international benchmark market. See: Handley, *Advice on the return on equity*, October 2014, p. 24.

1461 Handley, *Advice on the return on equity*, October 2014, pp. 23–24.

1462 SFG, *Equity beta*, May 2014, pp. 13, 28–33; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 68–73.

1463 SFG 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.

1464 SFG, *Equity beta*, May 2014, p. 13.

comparator set may not be helpful if that comparator set is less representative of what we are trying to estimate. In those cases, the mean the estimates will be clustered around will be less representative of the 'true' equity beta of a benchmark efficient entity. We do not consider this constitutes reliability. Therefore, we do not consider a larger comparator set of less relevant firms necessarily results in more reliable equity beta estimates, as the estimates may be biased.

It is also useful to note that Henry performed a separate time series regression for each comparator firm and various portfolios of comparator firms.[1465] The weekly returns for each firm are regressed against the weekly returns on the market over a period of time (the estimation period).[1466] 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.[1467] In addition, we place most reliance on averages of individual firm estimates and fixed weight portfolio estimates, which cluster around 0.5 (see section D.2.3). The focus on average and portfolio equity beta estimates further reduces any residual uncertainty associated with individual firm estimates.

We consider the available Australian data is sufficient for us to form an equity beta estimate that will contribute to the achievement of the allowed rate of return objective.[1468] The set of nine Australian comparators is reflective of the benchmark efficient entity and generates a consistent pattern of empirical equity beta estimates that is robust across econometric techniques and time periods. This is demonstrated in our analysis of Henry's 2014 report and other empirical studies based on Australian energy network firms (see Table 3-49 and section D.2.3).

In its 2015 reports for several service providers, SFG has again submitted that we should include the sample of 56 US energy firms in our comparator set of Australian energy network firms.[1469] It did not directly respond to any of the concerns we raised above.[1470] Instead, SFG maintained its view that including the 56 US energy firms in our comparator set would increase the reliability of our empirical equity beta estimates. We agree with SFG's view that it would be unreasonable to conclude that international comparators can never be used. However, for this decision, we do not include

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1465 Henry, *Estimating β: An update*, April 2014.

1466 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.

1467 Henry, *Estimating β: An update*, April 2014, pp. 17, 21.

1468 NER, cll. 6.5.2(c) and 6A.6.2(c); NGR, rule 87(3).

1469 SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 10–12; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 20.

1470 SFG only noted that our November 2014 draft decisions appear to focus on differences between the US and Australian market portfolios because we placed less reliance on factors such as geography/weather and vertical integration (see: SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 11). We do not agree with this view. The reasoning in this section shows clearly that we do not place less reliance on those factors.

international comparators in our Australian comparator set, for the reasons set out above.[1471]

In its 2015 report for several service providers, CEG also submitted that we should include the sample of 56 US energy firms in our comparator set of Australian energy network firms. It noted the objective is to estimate an equity beta that will give rise to a reasonable return on equity estimate over the subsequent regulatory period, which is a future period.[1472] CEG suggested that equity beta estimates based on our Australian comparator set does not best meet this objective because:

- many other regulators use international comparator firms
- the equity betas for Australian energy network firms have been affected by the mining boom (we address this issue in section D.2.2)
- it does not produce a reliable equity beta estimate.

We maintain our view that the available Australian data is sufficient for us to form a reliable equity beta estimate that contributes to the achievement of the allowed rate of return objective, for the reasons set out above. It is unclear how including US energy firms in our comparator set would better meets CEG's stated objective, because all regression based estimates rely on historical data. We consider we have sound reasons for our decision to use an Australian comparator set. We are not satisfied that other regulators' decisions provide sufficient evidence to change our decision.

We received submissions in 2014 from the CCP and other stakeholders that do not support the inclusion of international energy firms in our domestic comparator set.[1473] The PIAC and the EMRF submitted that the different samples of Australian and US equity beta estimates suggest SFG is attempting to combine two different population distributions.[1474] They considered SFG's merger of the two into a single average equity beta estimate, based on an arbitrary weighting of Australian and US firms, is dubious.

[1471] SFG also submitted that our Australian comparator is 'far from perfect' because the firms have both regulated and unregulated assets, and some of the firms have not been listed since 2006 or 2007 (see: SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 10–11). We never claimed to have a 'perfect' comparator set, and recognise the imperfections noted by SFG. However, we consider our comparator set of Australian energy network firms is still more reflective of the benchmark efficient entity than international energy firms. This is because there are many differences in factors that may affect the equity beta, such as the form of regulation, domestic economy, geography, business cycles, weather, market portfolio and structure of the firms (for example, vertical integration).

[1472] CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 33–34.

[1473] CCP, *Jam tomorrow? Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, pp. 16–17; CCP, *Jam tomorrow?—ACT version: Submission to ActewAGL's regulatory proposal for 2014–19*, August 2014, p. 13; PIAC, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, pp. 78–79; PIAC, *Submission to Jemena Gas Network's access arrangement proposal for 2015–20*, August 2014, pp. 5–6; EMRF, *Submission to Jemena Gas Network's access arrangement proposal for 2015–20, August 2014,* p. 88.

[1474] PIAC, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, pp. 78–79; EMRF, *Submission to Jemena Gas Network's access arrangement proposal for 2015–20, August 2014,* p. 88.

They also questioned SFG's exclusive use of US firms, without having considered energy network firms from other countries.

We received similar submissions in 2015. Origin supported our decision to use a comparator set of Australian energy network firms.[1475] It considered international comparators should not be used to the extent that the risks faced by these firms are not directly comparable to Australian conditions. PIAC considered a comparator set that included 56 US energy firms is not consistent with the conceptual model of the benchmark firm.[1476] QCOSS submitted similar views to PIAC and EMRF's 2014 submissions, and noted that US stocks are subject to very different operating and market conditions.[1477]

Based on the available evidence and after consideration of SFG and CEG's submissions, we maintain our view from the Guideline and November 2014 draft decisions.[1478] While increased statistical precision is desirable, it is not preferable if the resulting estimates are substantially less reflective of the 'true' equity beta for the benchmark efficient entity. We do not include the suggested sample of 56 US energy firms in our comparator set of nine Australian energy network firms. This is because we consider it will produce equity beta estimates that are substantially less reflective of the 'true' beta for the benchmark efficient entity. We consider including international energy network firms in our comparator set is not necessary in this case because our Australian comparator set is sufficient to produce a reliable equity beta range for the benchmark efficient entity (see Table 3-49 and section D.2.3).

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—provided the choice of overseas comparators is based on solid reasoning. Further, we consider it useful to examine evidence on many available international energy network firms, rather than only those based in the US.

1475 Origin, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, pp. 14–15.

1476 PIAC, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 44.

1477 QCOSS, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 78.

1478 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 49. SFG also submitted there are strong similarities between our current approach to beta estimate and the previous Tribunal's comments in relation to the debt risk premium (DRP). We do not consider the previous Tribunal's comments made in relation to the DRP are relevant to our equity beta estimation, and we provide reasoning for this in the Guideline material. See: SFG, *Equity beta*, May 2014, pp. 13–14; AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 64. SFG also submitted that we consider the use of international comparators as a binary choice—that we will rely on the domestic comparator set or the US comparator set. We do not agree with this view. As we state in this decision, we do not *include* SFG's suggested sample of 56 US energy firms in our domestic comparator set. See: SFG, *Equity beta*, May 2014, pp. 35–36; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 74–75.

D.2.2 Methodological choices

In this section, we discuss the methodological choices we consider in our empirical analysis. These include estimation methods, time period selection, gearing, individual firm and portfolio estimates, and post estimation adjustments.

Estimation method

We consider equity beta estimates from both Ordinary Least Squares (OLS) and Least Absolute Deviation (LAD) estimators. We rely more on OLS estimates because OLS appears to be the most commonly used estimation method for estimating beta.[1479]

However, the OLS estimation method is sensitive to outliers in the underlying data. In the 2009 WACC review, we identified events that could create outlier observations in the market data used to estimate the equity beta. These could include business–specific events (for example, merger announcements) and events that are 'unrepresentative' of the market (for example, the 'technology bubble').[1480]

The LAD estimation method reduces the influence of extreme observations (or potential data outliers) on its estimates.[1481] It belongs to a class of estimators known as 'robust' estimators. Such estimators are not heavily affected by extreme observations in the data. Therefore, we consider LAD regression results as a robustness check on potential outliers in the underlying data. In its 2013 study, the Economic Regulation Authority (ERA) used two additional robust estimators, the MM and the Theil–Sen, because it considered different robust estimators can produce different results.[1482]

In its 2014 report, SFG submitted that the LAD estimation method produces systematically downward biased equity beta estimates and should not be used.[1483] It also submitted LAD estimation is not used to estimate equity beta in academic research or in commercial practice. We are not satisfied that SFG has produced compelling evidence to infer the LAD estimator produces systematically downward biased estimates of equity beta. In a report submitted by the Energy Networks Association (ENA) during the Guideline process, Brooks, Diamond, Gray and Hall considered the value–weighted average of equity beta estimates from their in–sample market index should equal 1.0.[1484] For the in–sample market index used by the

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1479 Greene notes, 'Chapter 2 defined the linear regression model…There are a number of different approaches to estimation of the parameters of the model. For a variety of practical and theoretical reasons that we will explore as we progress though the next several chapters, the method of least squares has long been the most popular'. See: Greene, *Econometric analysis*, Pearson Education (Prentice Hall): Fifth edition, 2003, p. 19. Additionally, OLS is the method used for beta estimation in: Peirson, Brown, Easton, Howard, Pinder, *Business Finance*, McGraw-Hill Australia: Tenth edition, 2009, p. 195.

1480 AER, *Review of the WACC parameters: Final decision*, May 2009, pp. 267–271.

1481 Greene, *Econometric analysis*, Pearson Education (Prentice Hall): Fifth edition, 2003, p. 448.

1482 ERA, *Rate of return guideline explanatory statement*, December 2013, p. 179.

1483 SFG, *Equity beta*, May 2014, p. 12.

1484 Brooks, Diamond, Gray, Hall, *Comparison of OLS and LAD regression techniques for estimating beta*, June 2013, pp. 9–10.

authors, the value–weighted averages of OLS beta estimates presented do equal 1.0, while the value–weighted averages of LAD beta estimates are below 1.0. The authors consider this evidence that the LAD technique itself leads to a systematic downward bias in equity beta estimates. We have the following concerns with SFG's view that LAD equity beta estimates are systematically downward biased:

- SFG has not provided us with any basis to expect LAD estimates of equity beta to be systematically downward biased. We consider that discovering LAD estimates are lower than OLS estimates ex post, on a particular subset of the market, does not necessarily indicate systematic bias.
- The value–weighted average of LAD equity beta estimates across all firms in the authors' particular market index are 0.98, 0.96 and 0.99.[1485] The authors do not justify a link between the particular market index they have used and more commonly used market indexes. We also note that in his 2014 report, Henry stated that the difference between his OLS and LAD estimates of equity beta 'is almost universally statistically insignificant'.[1486]

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. For example, in Henry's 2014 report, the minimum re-levered OLS estimate is 0.39 and the minimum re-levered LAD estimate is 0.38 (see section D.2.3).

Time period selection

There is generally a trade–off in determining the length of the estimation period. Older data might be considered less reflective of current systematic risk assessments (which would suggest a shorter, more recent period). On the other hand, a longer time period provides more observations, which improves the accuracy of estimates, all else equal. Therefore, we consider equity beta estimates measured over a number of estimation periods, including:[1487]

- the longest period available (which Henry recommends in his 2014 report)
- the period after the 'technology bubble' and before the global financial crisis (GFC)[1488]
- the last five years of available data.

[1485] Brooks, Diamond, Gray, Hall, *Comparison of OLS and LAD regression techniques for estimating beta*, June 2013, p. 10.

[1486] Henry, *Estimating β: an update*, April 2014, p. 62.

[1487] Henry, *Estimating β: An update*, April 2014, pp. 11–12, 63. Henry uses data up to 28 June 2013.

[1488] For individual firms, Henry used an estimation period from 2002 to present (excluding the GFC) and for the fixed weight portfolios Henry used the longest period available (excluding the technology bubble and GFC). Henry defined the first week in the tech boom as the week ending on Friday 3 July 1998, and defined the last week as that ending on Friday 28 December 2001. Henry defined the first week during the GFC as the week ending on Friday 5 September 2008, and the end of the GFC as the week ending on Friday 30 October 2009. Henry, *Estimating β: An update*, April 2014, pp. 11–12.

In its 2015 report, CEG submitted that there is evidence that equity beta estimates for Australian energy network firms have been affected by the mining boom.[1489] It submitted this period is distinguished by high market capitalisation on high beta mining stocks. Therefore, the betas of all other stocks were depressed relative to those measured against other market portfolios. CEG submitted that this can be accounted for by:

- excluding the mining boom period from the estimation periods used
- adjusting the equity beta estimates from that period upward
- giving more weight to equity beta estimates measured in markets that were less affected by the mining boom (such as the US and European markets).

We do not agree with CEG's view. We consider that, at any given time, there are sectors of the economy that are experiencing relative booms and busts. In his 2015 report, Partington stated that 'mining booms are a regular feature of Australian equity markets rather than abnormal one off events'.[1490] He considered mining booms are a part of what is normal in Australian equity markets. Therefore, we do not consider the mining boom period CEG refer to is an abnormal market event. As such, we do not consider this period should be removed from the estimation periods we use to estimate the equity beta. We also do not consider it is reasonable to adjust our equity beta estimates upward over the mining boom period or include international energy firms in our domestic comparator set (see section D.2.1). In our view, CEG's proposed upward adjustment to Australian equity beta estimates of between 0.1 to 0.3 is arbitrary and not based upon sufficiently robust analysis.[1491] This is because it appears to be based on visual inspection of two graphs.[1492] The first compares beta estimates for 'material and financial' sub-indices with beta estimates for all other sub indices. The other compares one year daily beta estimates for Australian utilities stocks with one year daily beta estimates US and European utilities.

There is also a trade–off in determining the length of the return interval (or estimation interval). A short return interval increases the frequency of the data used and generates more observations. However, short return intervals can cause distorted results because of the effects of thin trading.[1493] We rely more on equity beta estimates

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1489 CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 33–34, 46–58.

1490 Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 76–77.

1491 CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 57–58.

1492 CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 57–58.

1493 Early papers on thin trading effects include Scholes and Williams (1977) and Dimson (1979). Thin trading biases beta estimates downwards. More infrequent trading implies larger gaps in time between when the share price was last updated and when the market index was last updated. This reduced synchronicity with the market can result in reduced covariance between share (or asset) returns and market returns. This tendency towards bias increases as the return interval decreases, as the proportion of the interval's return covered by the time gap increases as the return interval decreases. See: Dimson, *Risk measurement when shares are subject to infrequent trading*, Journal of financial economics, 7(2), 1979, pp. 197–226; Scholes and Williams, *Estimating betas from non-synchronous data*, Journal of financial economics, 5(3), 1977, pp. 308–328.

based on weekly return intervals, but monthly return intervals are considered as a robustness check.

Henry collected weekly data from Datastream. Datastream provides these weekly price observations using the close on the last trading day within each week, defining the end of the week as Friday. Monthly returns were calculated each month using the last closing price of the month.[1494]

In its 2014 reports, SFG, submitted that equity beta estimates can vary materially depending on how the return interval is defined (in particular, what reference day is chosen to calculate weekly or monthly returns).[1495] SFG referenced a report by CEG which was submitted to the ERA in 2013.[1496] This report presented a diagram showing variation in equity beta estimates depending on which day of the week or month is used as the reference day of the return interval.[1497] SFG subsequently proposed a regression based equity beta estimate that used four–weekly return intervals, but with the analysis repeated twenty times so that it does not 'ignore any stock and market returns information'.[1498]

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.[1499] SFG and CEG have looked at the data ex post and discovered variation in equity beta estimates. Variation is inherent in statistical estimation, and we can expect estimates to differ when the underlying inputs are changed. Indeed, sampling distributions are formed on the basis that estimates will differ under different samples of the same population. We consider variation in equity beta estimates, in itself, does not indicate whether particular return intervals underestimate or overestimate the 'true' equity beta of the benchmark efficient entity.

SFG considered our equity beta estimates are unreliable because we do not account for this variation in equity beta estimates. However, we note that SFG has not determined whether the differences in estimates based on different reference days for weekly (or monthly) return intervals are statistically significant. As it stands, the diagram presented in SFG's (and CEG's) report shows the equity beta estimates based on different days of the week fall within the range of 0.5 to 0.65.[1500] This is well

1494 Henry, *Estimating β: An update*, April 2014, pp. 9–10.

1495 SFG, *Equity beta*, May 2014, pp. 29–31; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 69–71.

1496 CEG, *Regression estimates of equity beta*, September 2013, pp. 25–27.

1497 CEG, *Regression estimates of equity beta*, September 2013, pp. 26, figure 3. The same diagram is presented in: SFG, *Equity beta*, May 2014, p. 30, figure 3 and SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 70, figure 8.

1498 SFG, *Regression based estimates of risk parameters for the benchmark firm*, June 2013, p. 5.

1499 We discuss this issue in relation to weekly returns because we rely more on these estimates. However, the same reasoning applies to monthly return intervals.

1500 See: SFG, *Equity beta*, May 2014, p. 30, figure 3; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 70, figure 8. SFG's figure 3 (and figure 8) shows the average equity beta estimates (over six Australian energy network firms) based on difference reference days for weekly and monthly return within our empirical range of 0.4 to 0.7. SFG also produces an average equity beta estimate of 0.60 by repeating its analysis 20 times using different start points within the four–weekly period.[1501] This estimate is again within our empirical range.

Further, if we continue with SFG's logic that no stock and market returns information should be ignored, we come to the problem that there is an infinite choice of reference times which one can use to define a return interval. SFG based its equity beta estimates on four–weekly returns using all daily closing prices.[1502] If SFG consider the reference day of the return interval is an arbitrary choice, then the same logic would apply to the reference time of the return interval. If equity beta estimates vary according to return intervals based on different days, then they may also vary according to return intervals based on different times. When we analyse the logic of SFG's submission we realise there is, in theory, an infinite choice of return intervals to choose from, and one cannot account for all these possibilities.[1503]

We base our return intervals on closing prices. That is, we use the closing price of the last trading day within each week (and month). We consider this a reasonable choice, and are not aware of any reason to expect basing our return interval on a particular day of the week (or month) will underestimate or overestimate equity beta. Additionally, basing return intervals on the close of the week (Friday) or month appears to be common practice. For example:[1504]

- For its equity beta estimation, Bloomberg calculates weekly returns using Friday to Friday data.
- Datastream provides weekly price observations using the close of the last trading day within each week (Friday), as noted in Henry's 2014 report.
- In two 2013 reports for the ENA, Brooks, Diamond, Gray and Hall estimated beta based on four–week return intervals computed using Friday closing prices.
- The ERA's empirical analysis of equity beta for Australian energy network firms uses return intervals based on Friday closing prices

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intervals. Column two (Monday) to column six (Friday) show the average estimates for weekly return intervals. Visual inspection of these five columns show the highest average estimate is for a weekly return interval ending Tuesday (below 0.65), and the lowest is for a weekly return interval ending Thursday (above 0.5).

[1501] Based on SFG's estimate for Australian energy network firms. See: SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, pp. 5, 13.

[1502] SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, p. 15, footnote 28.

[1503] We consider that in theory there is an infinite choice of return intervals to choose from. However, in practice, this would not be the case. The choice would be limited by how often trades are reported and what the smallest return interval would be.

[1504] Bloomberg help desk, *Inquiry reference number H#516253958*, 22 August 2014; Henry, *Estimating β: An update*, April 2014, p. 9; Brooks, Gray, Diamond and Hall, *Comparison of OLS and LAD regression techniques for estimating beta*, June 2013, p. 6; Brooks, Gray, Diamond and Hall, *Vasicek adjustment to beta estimates in the capital asset pricing model*, June 2013, p. 9; ERA, *Rate of return guideline explanatory statement*, December 2013, p. 168; Center for Research in Security Prices, *Data definitions—R*, viewed 5 November 2014, last updated July 2014, see link: http://www.crsp.com/products/documentation/data-definitions-r.

- The Centre for Research in Security Prices and Compustat merged database calculates monthly holding period returns from month end to month end.

In its 2015 report, SFG reiterated its view on this issue.[1505] It submitted that even if there is no reason to expect that returns based on a particular day of the week will underestimate or overestimate equity beta for the benchmark efficient entity, it remains that the equity beta estimates do vary. SFG again submitted that averaging across equity beta estimates from different return intervals (by varying the reference day) produces a more precise and reliable estimate. We maintain our view on this issue for the reasons set out above. We reiterate that variation is inherent in statistical estimation and basing return intervals on the close of the week or month appears to be common practice. We consider performing more computations does not necessarily result in a better estimate, and it is impossible to average over every choice in the estimation process (for example, there are choices outside of defining the return interval).

Based on the available evidence and submissions, we are satisfied that return intervals based on the closing price of the last trading day within each week (and month) is reasonable.[1506]

Gearing

The raw equity beta estimates of comparator businesses will reflect varying levels of actual financial leverage. These raw estimates can be de-levered to obtain the asset beta of the business. The result of de-levering reflects the beta of the asset if the asset was financed 100 per cent by equity, with zero debt. These asset betas can then be re-levered to match the level of gearing associated with the benchmark efficient entity (as adopted by the regulator).

We have adopted a gearing ratio of 60 per cent for the benchmark efficient entity, and we use the Brealey–Myers formula (assuming a debt beta of zero) to de-lever and re-lever the comparable businesses' equity beta estimates. That is:

$$\beta_e = \beta_a \left(1 + \frac{D}{E}\right)$$

where:

  - β_e is the equity beta

[1505] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 29–30.

[1506] Figure 4 of SFG's 2014 report is titled 'Domestic beta estimates by day of week'. However, the estimates presented are from US energy firms. SFG also referenced another CEG report that suggested Henry had arbitrarily changed the return interval used to estimate equity beta for US energy firms from his 2008 to his 2009 report. Henry did not define the return interval used to estimate these US equity betas. However, we consider this to be irrelevant as we do not place any consideration on the US estimates from those reports in this empirical analysis. See: SFG, *Equity beta*, May 2014, pp. 30–31, figure 4; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 70–71, figure 9; CEG, *AER equity beta issues paper: International comparators*, appendix A, October 2013, pp. 41–45.

- β_a is the un-levered asset beta, and
- $\frac{D}{E}$ is the debt to equity ratio.

We note there are views both for and against de-levering and re-levering equity beta estimates. On one hand, the resulting estimates will be more aligned with our benchmark. On the other hand however, 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. Therefore, we consider both raw and re-levered equity beta estimates where possible.

We also note the choice of whether or not to de-lever and re-lever is unlikely to be material on the average of individual firm estimates. This is because the industry average gearing and the benchmark gearing are very similar. However, the difference between raw and re-levered equity beta estimates for individual firms may be greater because some firms have higher or lower gearing than the benchmark efficient entity.

Individual firm and portfolio estimates

Because no one comparator firm is perfectly reflective of the benchmark efficient entity, we rely on averages of individual firm estimates to determine the equity beta range. We consider taking an average over the individual equity beta estimates is likely to produce an equity beta estimate that is more reflective of the benchmark efficient entity than considering individual firm estimates in isolation. In this respect, we also consider equity beta estimates from various portfolios of comparator firms. Averages of individual firm estimates and portfolio estimates combine information from multiple comparator firms, instead of considering single firms in isolation.

We consider the average of individual firm estimates, not the median. We received submissions in 2014 from the EMRF, Major Energy Users (MEU), UnitingCare Australia (UnitingCare) and Norske Skog Paper Mills, which considered Henry's 2014 report indicates we should choose an equity beta estimate closer to the median of the individual firm estimates.[1507] We received a number of similar submissions in 2015.[1508] We do not consider there is evidence in Henry's 2014 report that indicates a

[1507] EMRF, *Submission to TransGrid's revenue proposal for 2014–19, July 2014, pp. 31–31;* EMRF, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19, July 2014, p. 35*; Norske Skog Paper Mills, *Submission to TransGrid's revenue proposal for 2014–19*, August 2014, p. 8; MEU, *Submission to TasNetworks' revenue proposal for 2014–19*, August 2014, pp. 33–34; UnitingCare, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19, September 2014, p. 20;* UnitingCare, *Submission to ActewAGL's regulatory proposal for 2014–19, September 2014, p. 20.*

[1508] See: UnitingCare, *Submission to SA Power Networks' regulatory proposal for 2015–20*, February 2015, p. 32; ECCSA, *Submission to SA Power Networks' regulatory proposal for 2015–20*, December 2014, p. 74; Origin, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2015, p. 79; QCOSS, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, pp. 77–78; TSBC, *Submission to TasNetworks' revised revenue proposal and AER draft decision for 2014–19*, February 2015, p. 28.

preference for median equity beta estimates over average equity beta estimates. The median is also not the most common value in a sample (as some of these submissions have stated), it is the middle value of a sample.[1509] We prefer average estimates because they contain information from all individual firm estimates in our comparator set. Median values may be preferable to mean (average) values when significant outliers exist in the sample. However, we consider our comparator set (or sample) is reasonably comparable to the benchmark efficient entity. Therefore, we consider taking the average of individual firm estimates is reasonable.

Portfolio estimates combine the returns of various comparator firms by taking an average or median of these returns over a specific time period. Equity beta estimates can be derived from various types of portfolios, including:[1510]

- equal weight portfolios—which consist of *n* businesses and each business has a weighting of 1/*n*
- value weight portfolios—where the weighting on each business is proportional to the market capitalisation of the business relative to the market capitalisation of that entire portfolio
- time varying portfolios—where the weights in the portfolios vary over time due to businesses being introduced into the portfolio as they become listed on the market and being removed when they are no longer listed.

Henry recommends that we exercise great caution when interpreting equity beta estimates from the time varying portfolios.[1511] This is because he considers they are not grounded in financial theory, prone to measurement error and unlikely to yield reliable evidence. Therefore, we do not place any material reliance on the equity beta estimates from time varying portfolios.

In its 2015 report, SFG submitted that Henry's concerns on the reliability of equity beta estimates from time varying portfolios only holds if the firms in the portfolio have different levels of systematic risk.[1512] SFG considered that this means Henry's concerns mirror SFG's concerns over the reliability of empirical equity beta estimates, particularly for our small Australian comparator set.

We disagree with SFG's view. We are not satisfied that Henry's concerns regarding time varying portfolios imply that regressions of stock returns on market returns in general may not provide reliable equity beta estimates.[1513] Further, we are aware that the true systematic risks of our nine Australian comparator firms are not identical. We consider they are reasonable, not perfect, comparators to the benchmark efficient entity, with reasonably similar levels of systematic risk. If we included SFG's suggested

[1509] The most common value in a sample is referred to as the mode.
[1510] Henry, *Estimating β: An update*, April 2014, pp. 34–36.
[1511] Henry, *Estimating β: An update*, April 2014, p. 52.
[1512] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 30–31.
[1513] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 31.

sample of 56 US energy firms in our comparator set, this problem would likely be amplified. This is because the systematic risks of international energy firms are likely to be even more divergent from the systematic risk of the (Australian) benchmark efficient entity.

Blume and Vasicek adjustments

We do not apply Blume or Vasicek adjustments to our equity beta estimates. We took the same view in the Guideline and the 2009 WACC review, and this material remains relevant.[1514] In the 2009 WACC review we stated:[1515]

> Neither the Blume nor Vasicek adjustments (assuming a 'prior belief' of one) should be applied in a regulatory context as either adjustment is likely to introduce an upwards bias in the beta estimates.

In its 2014 report, SFG again proposed we apply a Vasicek adjustment to our equity beta estimates.[1516] It submitted that the Vasicek adjustment is necessary to correct for statistical estimation error and is commonly employed in practice. It also submitted that Vasicek–adjusted OLS estimates provide a better fit to the data and referenced a 2013 report for the ENA by Brooks, Diamond, Gray and Hall.[1517]

We recognise the potential merits of Vasicek's adjustment of equity beta estimates based on prior information and the use of this approach by some market practitioners. However, we have conceptual concerns with SFG's prior information assumptions when applying this approach.

The original Vasicek paper applies a Bayesian estimation of equity beta for a single firm.[1518] A key part of Bayesian estimation is the formulation of an appropriate prior distribution (mean and variance), which is based on the analyst's beliefs about the parameter of interest before seeing the data.[1519] This prior information is used to inform the distribution implied by a sample of data, and the resulting distribution is known as the posterior distribution. Therefore, estimates calculated using a Bayesian approach will combine information from a sample of data with subjective prior information.

Vasicek's paper estimates equity beta for a single firm, and formulates a prior distribution based on a cross–sectional distribution of beta estimates across all firms in

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[1514] AER, *Review of WACC parameters: Final decision*, May 2009, p. 243; AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 58.

[1515] AER, *Review of WACC parameters: Final decision*, May 2009, p. 243.

[1516] SFG, *Equity beta*, May 2014, p. 11.

[1517] This report was submitted during the Guideline development process. Brooks, Diamond, Gray and Hall, *Vasicek adjustment to beta estimates in the capital asset pricing model*, June 2013.

[1518] Vasicek, *A note on using cross-sectional information in bayesian estimation of security betas*, Journal of Finance 28(5), December 1973, p. 1233.

[1519] Kennedy, *A guide to econometrics, Wiley–Blackwell*: Sixth edition, 2008, p. 216. Also see: Greene, *Econometric analysis*, Pearson Education (Prentice Hall): Fifth edition, 2003, p. 430.

the US market, which has a mean of 1.0.[1520] Therefore, Vasicek sets a prior belief that the equity beta for a single firm is 1.0 on average, which is consistent with the idea of a firm being drawn randomly from the market as a whole.

This brings us to the question, what is the appropriate prior information for our purposes? SFG has proposed a similar prior distribution to Vasicek.[1521] This suggests a prior belief that the equity beta of the benchmark efficient entity is equal to the average across all firms in the market. However, our situation is different to Vasicek's. We are not randomly drawing firms from the market as a whole. Instead, we have a set of firms that have been carefully selected to represent the benchmark efficient entity. Therefore, we do not consider establishing a prior belief based on the equity beta of all firms in the market is appropriate for our purposes. As Vasicek himself stated:[1522]

> If nothing is known about a stock prior to sampling except that it comes from a certain population of stocks (for instance, from the population of all stocks traded on the New York Stock Exchange), an appropriate choice of the prior density is the cross–sectional distribution of betas observed for that population.

The population in our case is not the entire market. We have a set of Australian energy network firms that have been carefully selected to be comparable to a theoretical benchmark efficient entity. Based on conceptual analysis, we expect the benchmark efficient entity to have an equity beta less than 1.0 (see section D.1). However, our conceptual analysis is qualitative in nature and as such we do not have a prior expectation of the magnitude of the equity beta for the benchmark efficient entity.

Notwithstanding our conceptual concerns, we do not consider SFG has provided us with sufficient evidence to conclude that Vasicek–adjusted equity beta estimates are more reliable than unadjusted estimates. The 2013 report from Brooks, Diamond, Gray and Hall asserted that return on equity estimates (from the SLCAPM) provide a better fit to the data when Vasicek–adjusted OLS equity beta estimates are used than when unadjusted OLS estimates are used.[1523] This leads the authors to their conclusion that Vasicek–adjusted OLS estimates of equity beta are more reliable than unadjusted OLS estimates. We make the following points in response to their analysis:

- The analysis is based on the entire market. We are not estimating the return on equity for all firms in the market, or on firms drawn at random from the market. We are estimating a return on equity that is representative of the benchmark efficient entity.

[1520] Vasicek uses the New York Stock Exchange as a market proxy. See: Vasicek, *A note on using cross-sectional information in bayesian estimation of security betas*, Journal of Finance 28(5), December 1973, p. 1234.

[1521] SFG, *Equity beta*, May 2014, p. 10.

[1522] Vasicek, *A note on using cross-sectional information in bayesian estimation of security betas*, Journal of Finance 28(5), December 1973, p. 1237.

[1523] The authors measure goodness of fit using the R–squared statistic. See: Brooks, Diamond, Gray and Hall, *Vasicek adjustment to beta estimates in the capital asset pricing model*, June 2013, p. 3.

- The SLCAPM is an expected returns model. As such, we do not consider an analysis using realised returns provides clear evidence that Vasicek–adjusted estimates of equity beta are preferable to unadjusted estimates.

Lastly, the practical outcome is that applying the Vasicek adjustment in the manner recommended by SFG made little to no difference on the equity beta estimates. SFG itself noted that the average difference between the OLS estimate and Vasicek–adjusted OLS estimate is just 0.03 for the nine Australian energy network firms.[1524]

In its 2015 report, SFG has again proposed we apply a Vasicek adjustment to our equity beta estimates.[1525] It again submitted that the Vasicek adjustment is a correction for statistical bias in regression based estimates of equity beta, and it produces a more reliable equity beta estimate. SFG did not provide new analysis to support its view. We continue to disagree with SFG's view, for the reasons set out above. We also note the following statement from Partington:[1526]

> 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)

We now turn to the empirical evidence presented in Henry's 2014 report to the AER. The following subsection analyses the results.

D.2.3 Empirical evidence from Henry's 2014 report

Henry's 2014 report presented empirical evidence on equity beta for our comparator set of nine Australian energy network firms, using available data from 29 May 1992 to 28 June 2013.[1527] This report presented estimates for individual firms as well as various portfolio specifications, and used a range of different estimation methods and time periods. Based on our discussion of methodological choices (section D.2.2), we consider the most useful empirical estimates:

- use the OLS estimator (with the 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)
- are based on averages of individual firm estimates and fixed weight portfolios (equal weighting and value weighting)

[1524] SFG, *Regression-based estimates of risk parameters*, June 2013, p. 6.
[1525] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 31.
[1526] Partington, *Report to the AER: Return on equity (updated),* April 2015, pp. 33–34.
[1527] Henry, *Estimating β: An update*, April 2014, p. 9.

- do not apply a Blume or Vasicek adjustment.[1528]

We consider the equity beta estimates presented in Henry's empirical analysis support a range of 0.4 to 0.7. Table 3-47 and Table 3-48 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.[1529]
- 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.[1530]

Table 3-47 Average of re-levered equity beta estimates (individual firm) from Henry's 2014 analysis (OLS, weekly)

	Longest available period	2002 to 2013 (excl. 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 3-48 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 available period (excl. tech	0.49	0.52	0.55	0.53	0.45

[1528] Henry does not apply a Blume or Vasicek adjustment of any of his estimates, as specified in our terms of reference.

[1529] 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.

[1530] These estimates are not presented but can be found at: Henry, *Estimating β: An update*, April 2014, pp. 90–93.

	P1	P2	P3	P4	P5
boom and GFC)					
Value weighted					
Longest available period[(a)]	0.50	0.70	0.44	0.42	0.39
longest available period (excl. tech boom and GFC)	0.54	0.70	0.52	0.50	0.48

Source: AER analysis; Henry, *Estimating β: An update*, April 2014.

(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.

Note: Henry's 2014 report also presented time varying portfolio estimates of equity beta. We do not place any material reliance on these estimates for reasons discussed under the 'Individual firm and portfolio estimates' subsection of section D.2.2. However, these OLS estimates range from 0.39 to 0.53. See: Henry, *Estimating β: An update*, April 2014, p. 56.

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'.[1531] The results are as follows:[1532]

- the re-levered LAD estimates range from 0.38 to 0.58 and the raw LAD estimates range from 0.31 to 0.60.[1533]
- the OLS estimates using monthly return intervals range from 0.37 to 0.58.[1534]

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

[1531] Henry, *Estimating β: An update*, April 2014, p. 62.

[1532] These equity beta estimates are not presented but can be found at: Henry, *Estimating β: An update*, April 2014, pp. 17–43. The estimates considered are fixed weight portfolio estimates (equal weighting and value weighting) and averages of individual firm estimates.

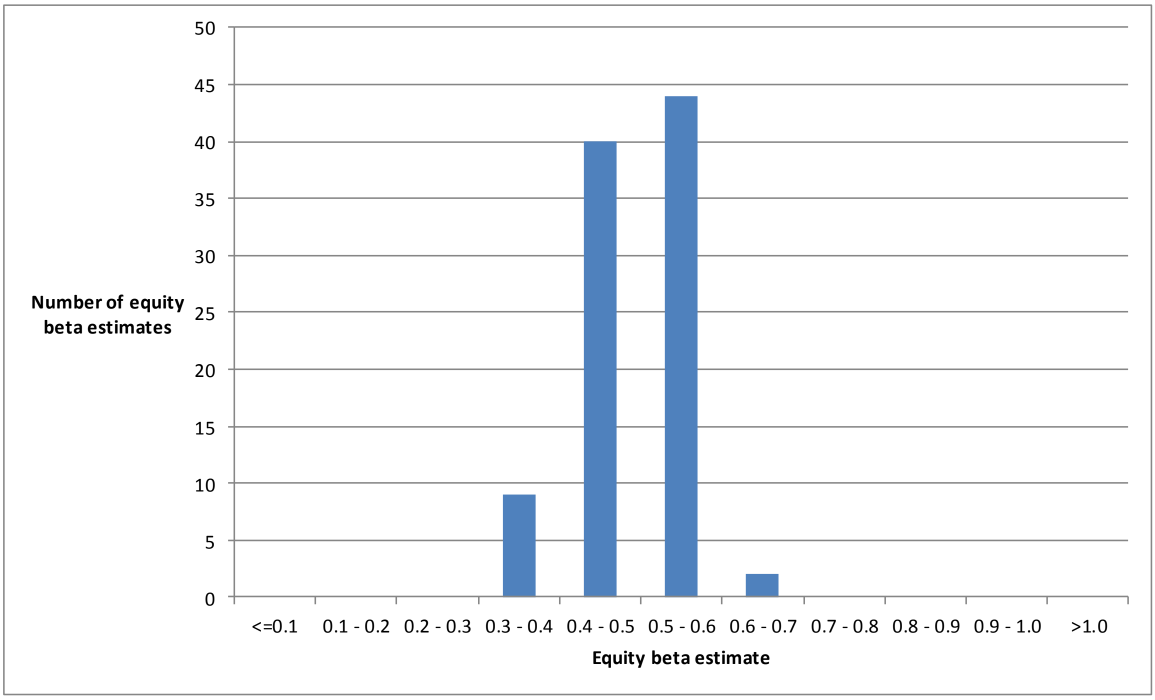
[1533] The raw LAD estimates can be found at: Henry, *Estimating β: An update*, April 2014, pp. 87–89 (for averages of individual firm estimates) and Henry, *Estimating β: An update*, April 2014, pp. 90–93 (for fixed weight portfolio estimates). Henry also presented LAD equity beta estimates for time varying portfolios, and these estimates range from 0.39 to 0.53. See: *Henry, Estimating β: An update*, April 2014, p. 56.

[1534] 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.

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'.[1535] Therefore, we are satisfied the estimates presented in Henry's 2014 report are reasonably stable and not significantly affected by thin trading.

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 the benchmark efficient entity. This is because most of the estimates are clustered around 0.5, as shown in Figure 3-27.

Figure 3-27 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.

[1535] 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.

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.

In its 2014 reports, SFG expressed concerns regarding the reliability of equity beta estimates based on a small comparator set of Australian energy network firms.[1536] We discuss these concerns below. However, we note that the service providers and their consultants have raised concerns about the reliability of our empirical estimates in the past. We provided detailed material addressing this issue in the Guideline process and Roma to Brisbane pipeline regulatory determination, and this material remains relevant.[1537]

SFG submitted that the equity beta estimates presented in Henry's report do not indicate a range of 0.4 to 0.7. In its report, SFG presented a diagram which shows that the individual firm estimates in Henry's report range from below 0.2 to just above 1.0.[1538] SFG submitted that this wide range of individual firm estimates indicates our equity beta estimates are unreliable. It also stated that these estimates 'vary wildly':[1539]

- across firms
- over time
- depending on which estimation method is used (OLS or LAD)
- depending on which return interval is used and the reference day chosen.

We also received submissions from the CCP in 2014, which submitted that most of the equity beta estimates presented in Henry's 2014 report are clustered around a range of 0.3 to 0.5.[1540]

SFG and the CCP used individual firm estimates to support their views.[1541] We consider the most useful empirical estimates are averages of individual firm estimates

[1536] SFG, *Equity beta*, May 2014, pp. 2–3; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 68–71.

[1537] AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 48–49; AER, *Draft decision: APT Petroleum Pipeline Pty Ltd, Access arrangement draft decision, Roma to Brisbane pipeline, 2012–13 to 2016–17*, April 2012, pp. 323–326. There is also relevant material in AER, *Final decision: APT Petroleum Pipeline Pty Ltd, Access arrangement final decision, Roma to Brisbane Pipeline, 2012–13 to 2016–17*, August 2012, pp. 230–235.

[1538] SFG, *Equity beta*, May 2014, p. 27, figure 2; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 68, figure 7.

[1539] SFG, *Equity beta*, May 2014, p. 3; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 68–71.

[1540] CCP, *Jam tomorrow? Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 16; CCP, *Jam tomorrow? – ACT version: Submission to ActewAGL's regulatory proposal for 2014–19*, August 2014, p. 12; CCP, *Submission to TasNetworks' revenue proposal for 2014–19*, September 2014, p. 8.

[1541] SFG used individual firm estimates to support its first, second and third points, but used an average estimate (of six comparator firms) to support its fourth point (variation based on which return interval used and the reference day chosen). See: Henry, *Estimating β: An update*, April 2014, pp. 28–31.

and fixed weight portfolio estimates, and these estimates range from 0.4 to 0.7 under almost every regression permutation considered, including:[1542]

- various portfolios containing different combinations of comparator firms
- different estimation periods and return intervals
- different estimation methods.

We also note that SFG's proposed 'best empirical estimate of beta' is based on averages of individual estimates for Australian energy network firms and US energy firms.[1543]

In regards to the consistency of our equity beta estimates over time, the re-levered OLS estimates presented in Henry's 2009 report range from 0.44 to 0.71.[1544] This is consistent with the range of OLS estimates presented five years later in Henry's 2014 report. The ERA drew a similar conclusion in its 2013 Rate of return guideline based on its own studies.[1545] Table 3-49 sets out empirical studies from 2002 that show equity beta estimates generally in line with the empirical range derived from Henry's 2014 estimates. If only OLS estimates are considered, then the equity beta estimates presented in these studies fall within the 0.4 to 0.7 range.[1546] These results demonstrate the consistency of our empirical equity beta estimates over time, as well as across various regression permutations.

We note that SFG's solution to this alleged unreliability of our estimates is to include a set of 56 US energy firms in our comparator set of Australian energy network firms.[1547] We discuss the role of international comparators in detail in section D.2.1. However, we note the individual equity beta estimates for these US firms display significant variability. They range from 0.49 to 1.51, according to SFG's analysis.[1548] If we accepted SFG's proposal and included the US energy firms in our comparator set, the range of our individual firm equity beta estimates would widen substantially as the highest number in the range would increase from 1.03 to 1.51.[1549]

1542 Except for the raw LAD estimates, which range from 0.3 to 0.6. However, the re-levered LAD estimates range from 0.4 to 0.6. We do not consider this is sufficient to justify adjusting our range.

1543 SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, pp. 2, 13.

1544 This range includes averages of individual firm estimates and fixed weight portfolio estimates. See: Henry, *Estimating β*, April 2009.

1545 ERA, *Rate of return guideline explanatory statement*, December 2013, p. 171.

1546 This is excluding time varying portfolios and Vasicek/Blume adjustments. See Table 3-49. The minimum OLS estimate is 0.37 (Henry's 2014 report, average of individual firm OLS estimates using monthly returns over the last five years) and the maximum OLS estimate is 0.71 (Henry's 2009 report, average of individual firm estimates using weekly returns over 2003–08).

1547 SFG, *Equity beta*, May 2014, p. 40; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 82.

1548 SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, p. 19.

1549 This includes all individual firm estimates (OLS, LAD, weekly returns, monthly returns, all estimation periods). Henry, *Estimating β: An update*, April 2014, p. 27.

In its 2015 report, SFG reiterated its concerns regarding the reliability of equity beta estimates based on a comparator set of Australian energy network firms.[1550] Similarly, the CCP again noted that most of the equity beta estimates presented in Henry's 2014 report are clustered around a range of 0.3 to 0.5.[1551] We have had regard to these submissions and maintain our view for the reasons set out above. We also note Partington's statement that:[1552]

> 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 also received a submission from the South Australian Council of Social Service (SACOSS) and South Australian Centre for Economic Studies (SACES) in 2015. This submission stated that the degree of agreement is striking between the Australian equity beta estimates from different regression permutations and studies.[1553]

Based on the available evidence and submissions, we do not consider our Australian empirical equity beta estimates are unreliable. In our discussion of the comparator set selection for the empirical analysis, we considered that SFG appears to have taken a narrow definition of what is reliable in this context. We are satisfied the set of nine Australian comparators are reflective of the benchmark efficient entity and generate a consistent pattern of empirical estimates that is robust across a range of different regression permutations.

D.2.4 Empirical evidence 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 3-49. 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. For example, we do not use Vasicek or Blume adjusted estimates to inform our equity beta range and do not place

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[1550] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 10–11. SFG also submitted that our estimates are imprecise with wide standard errors. However, SFG has not provided analysis to support this submission. Moreover, as discussed in section D.2.1, we do not consider increased statistical precision (or reduced dispersion) necessarily results in more reliable equity beta estimates. We also note that Henry performed tests for thin trading and parameter instability in his analysis and concluded that there was no significant issue with thin trading or stability in his equity beta estimates.

[1551] CCP, *Submission: AER draft TransGrid determination TransGrid revised revenue proposal*, 6 February 2015, p. 12. The EUAA and UnitingCare made similar submissions (see: EUAA, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 16; UnitingCare, *Submission to SA Power Networks' regulatory proposal for 2015–20*, February 2015, p. 32). The Tasmanian Small Business Council (TSBC) also submitted that the equity beta estimates in Henry's 2014 report are heavily concentrated around the range 0.4 to 0.6 (see: TSBC, *Submission to TasNetworks' revised revenue proposal and AER draft decision for 2014–19*, February 2015, p. 28).

[1552] Partington, *Report to the AER: Return on equity (updated)*, April 2015, p. 22.

[1553] SACOSS, *Submission to SA Power Networks' regulatory proposal for 2015–20*, January 2015, p. 7; SACES, *Independent estimate of the WACC for SA Power Networks 2015 to 2020: Final report*, January 2015, p. 12.

any material reliance on time varying portfolio estimates. 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.

Table 3-49 Equity beta estimates for Australian energy network firms

Source	Time period	Individual firm averages	Fixed portfolios	Varying portfolios[(a)]	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			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		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		0.55	OLS regressions, four weekly repeat sampling, Vasicek adjustment, re-levered estimates, 9 comparators
ERA 2012	2002–2011	0.44–0.60			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		0.69–0.91	monthly return intervals, OLS/LAD regressions, multiple estimation periods, raw/re-levered estimates, average/median varying portfolios,

Source	Time period	Individual firm averages	Fixed portfolios	Varying portfolios[a]	Summary of regression permutations
					9 comparators
Henry 2008	2002–2008	0.35–0.67	0.31–0.77[e]		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
ACG 2002	2000–2002[f]	0.61–0.69			monthly return intervals, OLS regressions, raw/re-levered estimates (with varying debt betas), 4 comparators

Source: AER analysis.[1554]

(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.

(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.

In its 2015 letter for TransGrid, Grant Samuel and Associates (Grant Samuel) noted that it utilised a number of different sources to estimate the equity beta for each of the

[1554] 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.

energy network firms in its peer group.[1555] Grant Samuel submitted that we have averaged the different sources for each energy network firm to derive the equity beta range of 0.42 to 0.62 for the sector, which it considered is inappropriate.

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 (excluding the Bloomberg estimates using the Morgan Stanley capital international developed world index (MSCI)). Averaging across the four Australian equity beta estimates for each source gives the following results:

- 0.42—from the Australian Graduate School of Management (AGSM)
- 0.64—from Bloomberg, using a local index and four years of monthly observations
- 0.62—from Bloomberg, using a local index and two years of weekly observations.

Grant Samuel also submitted that averaging over individual equity beta estimates disguises the unreliability of the data.[1556] We set out our reasons for averaging over individual firm estimates in section D.2.2. We also note that SFG, CEG and NERA use equity beta estimates based on averages of individual firm estimates.[1557]

D.3 International empirical estimates

In step two of section 3.4.1, we consider equity beta estimates derived from international comparators, and conclude this evidence should not be used as the primary determinant of the equity beta range or point estimate. This is because these estimates are less representative of the benchmark efficient entity (see section D.2.1). We use empirical estimates of international energy networks to inform the equity beta point estimate from within the range. We consider this evidence provides some limited support for an equity beta point estimate towards the upper end of our empirical range.

In the Guideline, we set out a number of international empirical equity beta estimates that ranged from 0.5 to 1.3.[1558] The studies we consider in this decision present equity beta estimates that range from 0.3 to 1.0.[1559] These studies are discussed below:

1555 Grant Samuel and Associates, *Letter—Grant Samuel response to AER draft decision*, 12 January 2015, p. 8.

1556 Grant Samuel and Associates, *Letter—Grant Samuel response to AER draft decision*, 12 January 2015, p. 8. Grant Samuel also submitted that we do not discuss issues regarding the reliability of equity beta estimates, such as standard errors or stability over time. We discuss these issues (which we consider are similar to those raised by SFG) in section D.2.3.

1557 SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, pp. 2, 13. CEG and NERA base their equity beta estimates on SFG's analysis. See: 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.

1558 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 64–67.

1559 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 empirical analysis section (see section D.2.2). We note that this de-levering and re-levering process may have more of an impact on international empirical estimates because the average industry gearing may not be similar to our benchmark gearing level of 60 per cent. If the Brealey–Myers formula is not an accurate representation of reality, then the re-levered international equity beta estimates may contain material error.

- 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.[1560] Based on the comparator sample provided by CEG, SFG computed equity beta estimates over an 11 year period from 2 January 2002 to 19 November 2012.[1561] The resulting OLS equity beta estimates are as follows:[1562]
    - raw:
        - 0.68 for the average equity beta of individual firms
    - re-levered to 60 per cent gearing:
        - 0.88 for the average equity beta of individual firms
        - 0.91 for the average equity beta of an equal–weighted index.[1563]
- The Damodaran equity beta estimates for US industry groups have been updated for 2014 market data. However, Damodaran has changed his industry classifications since 2013.[1564] 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 weekly return intervals and a five year estimation period (up to 2014 year–end). The resulting OLS equity beta estimates for the utilities (general) industry are as follows:[1565]
    - raw:
        - 0.59 as at January 2015
    - re-levered to 60 per cent gearing:[1566]
        - 0.92 as at January 2015.
- FTI Consulting's 2012 report for Ofgem provided equity beta estimates for three UK–listed energy network firms. FTI Consulting used daily return intervals and calculated the average daily returns for the sector as the market–capitalisation

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1560 CEG, *Information on equity beta from US companies*, June 2013, p. 7.

1561 SFG, *Regression-based estimates of risk parameters*, June 2013, p. 6.

1562 SFG, *Regression-based estimates of risk parameters*, June 2013, pp. 15, 19. SFG's results incorporate a Vasicek adjustment to its OLS equity beta estimates. We do not apply a Vasicek adjustment in our decision. The raw average equity beta estimate without a Vasicek adjustment is 0.67.

1563 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.

1564 'Utilities' have been separated into water and 'general' (which consists of energy utilities). 'Power' contains mainly energy generation and retail services and 'Oil/Gas distribution' contains oil and gas pipelines. See: 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 2015, viewed 30 March 2015, see link: http://people.stern.nyu.edu/adamodar/.

1565 Damodaran, *Updated data: The Data page*, *Levered and Unlevered Betas by Industry*, Stern school of Business New York University, last updated 5 January 2015, viewed 30 March 2015, see link: http://people.stern.nyu.edu/adamodar/.

1566 We have de-levered and re-levered the raw equity beta estimates from Damodaran's data.

weighted average of the returns for National Grid, Scottish and Southern Energy and Scottish Power. The resulting raw OLS equity beta estimates are as follows:[1567]

- 0.45 using one year of daily data (10 May 2011 to 9 May 2012)
- 0.48 using two years of daily data (10 May 2010 to 9 May 2012).

- The Alberta Utilities Commission (AUC) published a 2013 report setting out an interim approved generic return on equity for all relevant utilities for 2014, until the full decision is published.[1568] For this decision, several experts contributed advice on the equity beta based on estimates of Canadian utilities. The resulting equity beta estimates recommended by these experts range from 0.45 to 0.70.[1569] We note the full decision has now been published and the equity beta estimates recommended by the experts range from approximately 0.3 to 0.7.[1570]
- PricewaterhouseCoopers (PwC) publish an annual report for New Zealand which outlines the cost of capital (and equity beta) for a number of companies classified by industry. The equity beta estimates are based on an average of monthly returns over (up to) five years.[1571] PwC's June 2014 report presents the following raw equity beta estimates for two New Zealand energy network firms as at 31 December 2013:[1572]
  - raw:
    - 0.6 for the average of individual firm estimates
  - re-levered to 60 per cent gearing:[1573]

1567 FTI Consulting, *Cost of capital study for the RIIO-T1 and GD1 price controls*, July 2012, p. 42. We are not able to provide re-levered equity beta estimates because the report does not provide the appropriate gearing data.

1568 The interim decision applied the 2011 generic cost of capital decision as a placeholder for 2014. See: AUC, *2013 Generic Cost of Capital*, December 2011, pp. 1–2.

1569 Alberta Utilities Commission, *2011 Generic Cost of Capital*, December 2011, pp. 8, 19–20. The relevant experts were Dr. Laurence Booth at the University of Toronto, Dr. Lawrence Kryzanowski at Concordia University, Dr. Gordon Roberts at York University and Ms. Kathleen McShane, president and senior consultant with Foster Associates Inc. of Bethesda, Maryland. This report did not specify whether the equity betas were raw or re-levered to a benchmark gearing.

1570 The relevant experts were Dr. Laurence Booth at the University of Toronto, Dr. Sean Cleary at Queen's University and Ms. Kathleen McShane, president and senior consultant with Foster Associates Inc. of Bethesda, Maryland. Dr Cleary 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 Booth recommended an equity beta range of 0.45 to 0.55 for Canadian stand-alone utilities based on long run beta estimates. Ms McShane 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), which we do not agree with. See: AUC, *2013 Generic Cost of Capital*, 23 March 2015, pp. 24–26. This report did not specify whether the equity betas were raw or re-levered to a benchmark gearing.

1571 See: http://www.pwc.co.nz/appreciating-value/pwc-wacc-formula/

1572 PwC, *Appreciating Value New Zealand, Edition five - IPO survey*, June 2014, p. 21. This report presented equity beta estimates of 0.5 for Horizon Energy Distribution Limited and 0.7 for Vector Limited.

1573 We have de-levered and re-levered the raw equity beta estimates from the data in PwC's report.

        - 0.87 for the average of individual firm estimates.

- The Brattle Group's 2013 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 year estimation period and daily return intervals. In response to CEG's concerns, we have used the Dimson beta where the adjustment is significant.[1574] The resulting average equity beta estimates are:[1575]
    - raw:
        - 0.58 for the average of European individual firm estimates
        - 0.60 for the average of US individual firm estimates
        - 0.58 for the average of European and US individual firm estimates
    - re-levered to 60 per cent gearing:[1576]
        - 0.71 for the average of European individual firm estimates
        - 1.01 for the average of US individual firm estimates
        - 0.80 for the average of European and US individual firm estimates.

In its 2014 reports for several service providers, SFG submitted that more weight should be placed on the empirical estimates of overseas (particularly US) energy networks, which it considers supports an equity beta point estimate above the 0.4 to 0.7 range.[1577] We do not agree with SFG's view for the following reasons:

- As discussed in section D.2.1, we do not consider empirical estimates of international energy networks are sufficiently representative of the benchmark efficient entity to warrant SFG's submission. In determining the role we place on international empirical estimates (see steps one and two of section 3.4.1), we considered the strengths and limitations of this form of evidence. We subsequently concluded that international empirical estimates would not be used to inform the equity beta range, only the point estimate.
- We consider SFG has placed a disproportionate amount of weight on equity beta estimates of US energy network firms, with little to no consideration of empirical estimates from other countries. This view has also been expressed in submissions from the EMRF and PIAC.[1578] We consider empirical equity beta estimates from a range of different countries. These estimates (presented above) show it is not clear that the international evidence supports an equity beta estimate above the top of

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[1574] See: CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 37.

[1575] The Brattle Group, *The WACC for the Dutch TSOs, DSOs, water companies and the Dutch pilotage organisation*, March 2013, pp. 16–18.

[1576] We have de-levered and re-levered the raw equity beta estimates from the data in Brattle Group's report.

[1577] SFG, *Equity beta*, May 2014, p. 32; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 72. SFG also consider we should include US energy firms in the comparator set for our empirical analysis.

[1578] EMRF, *Submission to Jemena Gas Network's access arrangement proposal for 2015–20*, August 2014, p. 87; PIAC, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 78.

our range. The range of the international empirical estimates is wide, with a number of estimates both above and below the top of our empirical range.

In its 2015 reports for several service providers, SFG again submitted that more weight should be placed on international empirical estimates (particularly from the US). SFG submitted that:[1579]

- international equity beta estimates should be used to produce equity beta estimates, and should be used in determining the equity beta range
- we do not set out a preferred point estimate of equity beta based on the international empirical estimates
- our analysis of international empirical estimates is incorrect because we consider both raw and re-levered estimates
- our analysis of international empirical estimates is incorrect because we do not consider the relative reliability of different studies
- the correct analysis of the international empirical evidence set out above is consistent with an equity beta estimate materially above 0.7.

We do not agree with SFG's submission for the following reasons:

- While we do use international equity beta estimates in producing the equity beta point estimate, we do not use it to determine the range. We explain our reasoning for this decision above and in steps one and two of section 3.4.1.
- We do not consider it is necessary to determine a specific equity beta point estimate for each source of evidence we consider. However, we note that the midpoint of the range of international empirical estimates presented above is 0.7.
- We consider raw and re-levered equity beta estimates in our analyses of Australian and international empirical estimates. We set out our reasons for this consideration in section D.2.2. We note that international energy firms are unlikely to have gearing levels close to our benchmark level of 60 per cent, and leverage adjustment formulae are likely to be simplifications of reality. If our chosen formula (Brealey–Myers) is not an accurate representation of reality, then the re-levered international equity beta estimates may contain material error. We note that, in his 2015 report, Partington cautioned against re-levering equity beta estimates in general. However, he considered the problems associated with re-levering are compounded when re-levering international equity beta estimates to an Australian

[1579] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 8, 12–18; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 19; SFG, *The required return on equity: Initial review of the AER draft decisions: Note for ActewAGL, Ausgrid, Essential Energy and Endeavour Energy*, 19 January 2015, pp. 33–39 (SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015); SFG, *The required return on equity: Initial review of the AER draft decisions: Report for Energex*, 30 January 2015, pp. 33–39 (this report is very similar to SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015 and therefore, any references we make to the 19 January 2015 in this appendix applies to this 30 January 2015 report).

benchmark gearing level because of institutional differences across countries. Partington considered attempts to re-lever international equity beta estimates to some assumed level of leverage in Australia are likely to be unreliable.[1580] We consider this issue highlights the limitations of using international empirical estimates to estimate the equity beta for an Australian benchmark efficient entity.

- We consider the international empirical estimates in a holistic manner, keeping in mind that there are inherent uncertainties when relating foreign estimates to Australian conditions. The reports we consider above are from reputable sources.[1581] Different reports use different estimation techniques because experts have different views on how best to estimate equity beta. We note that it would be difficult to find reports that are fully consistent with our preferred estimation approach. In relation to SFG's specific concerns:
    - We consider international empirical estimates of equity beta in this section, not other regulators' equity beta decisions. Therefore, Ofgem's decisions on equity beta are not relevant for this analysis. Similarly, the AUC's approach to determining the return on equity is not relevant for this analysis because the range of equity beta estimates presented above are based on regression analysis.[1582]
    - As discussed in section D.2.1, increasing the number of firms in the comparator set may increase the statistical precision of the resulting equity beta estimate. However, increased statistical precision is not preferable if the resulting estimates are substantially less reflective of the 'true' equity beta that is being estimated. Therefore, we are not satisfied that SFG has provided sufficient evidence to suggest a comparator set of three energy network firms necessarily produces unreliable equity beta estimates.[1583]
    - As discussed in section D.2.2, there is generally a trade–off in determining the length of the estimation period and the return interval. Therefore, we are not satisfied that SFG has provided sufficient evidence to suggest estimation periods of 1–3 years or daily return intervals necessarily produce unreliable equity beta estimates.[1584] We also note that using daily return intervals increases the number of observations in the time series dataset. Therefore, even though FTI Consulting and the Brattle Group use relatively short estimation periods, they may not have less observations in their dataset because they use daily return intervals.

[1580] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 74–75.

[1581] For example, we use estimates derived by well-respected advisory firms (PwC); expert consultants commissioned by regulators, energy network firms and other stakeholders (SFG, FTI Consulting, Brattle Group, experts used in AUC report); and academics (Damodaran).

[1582] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 15; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, p. 36.

[1583] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 14–17; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, pp. 35–38.

[1584] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 14–17; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, pp. 35–38.

- The AUC's 2013 Generic Cost of Capital is not a report that documents submissions to the regulator. It is a decision that sets out the approved return on equity for all affected utilities for the years 2013, 2014, and 2015.[1585] Evidence (including equity beta estimates) was provided by a number of experts that were sponsored by utilities and other stakeholders.
- SFG also presented re-levered equity beta estimates from Damodaran's analysis of European and global industry groups. These are 1.3 (European) and 0.9 (global).[1586] These equity beta estimates may increase the upper bound of the range of international empirical estimates but do not change our view on the evidence provided from international empirical estimates.

- We do not agree with SFG's interpretation of the international evidence we have presented above. We maintain our view that international empirical estimates support an equity beta range from 0.3 to 1.0 (or 0.3 to 1.3 if SFG's re-levered European and global estimates are included). These estimates span across a wide range. We do not consider this evidence implies an equity beta estimate materially above 0.7 for the benchmark efficient entity.[1587]

In its 2015 report for several service providers, CEG made similar submissions to SFG.[1588] The above considerations also apply to CEG, and we note the following:

- We agree with CEG that the equity beta estimates in the Brattle Group's report should apply the Dimson adjustment where the adjustment is significant and we have adjusted our estimates accordingly.[1589] However, we do not use the equity beta estimates presented in Table 10 of the report because they incorporate a Vasicek adjustment, which we do not agree with (see section D.2.2).
- We agree with CEG that the equity beta estimates from PwC's report should include the re-levered estimates, and we have adjusted our estimates accordingly.[1590] However, we consider both the raw and re-levered estimates.

We note the pattern of international results is not consistent and there are inherent uncertainties when relating foreign estimates to Australian conditions. We also note Partington's consideration that 'too much weight should not be given to inter-country comparisons and overseas betas'.[1591] However, based on the available evidence, we are satisfied the international empirical estimates provide some limited support for an equity beta estimate towards the upper end of our empirical range.

[1585] It also sets out individual deemed equity ratios (also referred to as capital structure) for each affected utility. See: AUC, *2013 Generic Cost of Capital*, 23 March 2015, p. 1.
[1586] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 14.
[1587] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 17; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, p. 38; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 19.
[1588] CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 34–38
[1589] CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, p. 37.
[1590] CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 37–38.
[1591] Partington, *Report to the AER: Return on equity (updated)*, April 2015, p. 76.

D.4 The theory of the Black CAPM

In step two of section 3.4.1, we consider the Black CAPM and conclude it should not be used as the primary determinant of the equity beta range or point estimate for the benchmark efficient entity. We also conclude that, because of the model's empirical instability, we only have regard to the theory underlying the Black CAPM. Therefore, we use the theoretical principles underpinning the Black CAPM to inform the equity beta point estimate from within our empirical range. We consider this evidence is consistent with an equity beta point estimate above the best empirical estimate implied from Henry's 2014 report, which is approximately 0.5 (see section D.2.3). In the Guideline we considered the theoretical underpinnings of the Black CAPM in detail and this material remains relevant.[1592]

The Black CAPM is an alternative model to the SLCAPM. As a result of slightly different starting assumptions, the Black CAPM predicts a slope of estimated returns that can be flatter than for the SLCAPM.[1593] This means that for firms with an equity beta below 1.0, the Black CAPM may predict a higher return on equity than the SLCAPM.

The key theoretical difference between the Black CAPM and the SLCAPM relates to borrowing and lending. The SLCAPM 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 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. More information on the Black CAPM can be found in section A.3.3.

We consider the theoretical principles underpinning the Black CAPM demonstrate that market imperfections could cause the true (unobservable) expected return on equity to vary from the SLCAPM estimate. For firms with an equity beta below 1.0, the Black CAPM may predict a higher expected return on equity than the SLCAPM. We use this theory to inform our equity beta point estimate, and consider it supports an equity beta above the best empirical estimate implied from Henry's 2014 report. However, while the direction of this effect may be known, the magnitude is much more difficult to ascertain. We do not consider this theory can be used to calculate a specific uplift to the equity beta estimate to be used in the SLCAPM. This would require an empirical implementation of the Black CAPM, and we do not give empirical evidence from the Black CAPM a role in determining the equity beta for a benchmark efficient entity (as discussed under step two of our foundation model approach in section 3.4.1).

1592 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 68–73.

1593 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.

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. In their 2014 (and 2015) report, 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.[1594] McKenzie and Partington noted there is considerable uncertainty in how the Black CAPM theory should be applied to a SLCAPM 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 SLCAPM.[1595]

On the basis of the available information, we consider that the theoretical principles underpinning the Black CAPM cannot indicate a specific value for the equity beta. However we consider this information supports an equity beta point estimate above the best empirical estimate implied from Henry's 2014 report, and is not inconsistent with an equity beta estimate towards the upper end of our empirical range.[1596]

In their 2014 reports for several service providers, SFG and NERA submitted that in the Guideline we used the Black CAPM to apply a specific uplift to equity beta to correct for 'low beta bias', and that the uplift applied was insufficient.[1597] This is a mischaracterisation. 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. Further, we do not accept that our use of the theory underlying the Black CAPM implies that we consider the SLCAPM produces biased return on equity estimates.[1598] This is discussed further in section D.5.3.

[1594] 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.

[1595] 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.

[1596] In the Guideline we performed a rough assessment of the reasonableness of the option to select a point estimate towards the upper end of the equity beta range (to reflect the differing predictions of the Black CAPM relative to the SLCAPM). We noted for clarity that we do not consider the possible zero beta premiums presented in table C.11 are accurate or reliable as empirical estimates because we do not consider that there is any reliable empirical estimate for this parameter. However, in light of the available evidence, if the Black CAPM captured the 'true' state of the world better than any other asset pricing model (although we are not implying that it does), selecting a point estimate towards the upper end of the equity beta range appears open to us. See: AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 70–71.

[1597] NERA, *Return on capital of a regulated electricity network*, May 2014, pp. 44, 68, 89–91; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 92–95; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 76–79, 83. SFG and NERA consider the SLCAPM produces downward biased return on equity estimates for low beta stocks (stocks with an equity beta less than 1.0). This is what they refer to as 'low beta bias'.

[1598] Our consideration is supported by McKenzie and Partington and Handley in their 2014 and 2015 reports. See: McKenzie and Partington, *Report to the AER: Part A return on equity*, October 2014, p. 23; Handley, *Advice on the return on equity*, October 2014, pp. 10–12; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 41–44; Handley, *Further advice in the return on equity*, April 2015, pp. 5–6.

In its 2015 reports for several service providers, SFG submitted that we have had regard to the Black CAPM in a convoluted manner. It submitted that we should have regard to the Black CAPM by either:[1599]

- empirically estimating the Black CAPM in a multiple model approach to estimating the return on equity
- empirically estimating the Black CAPM return on equity and then inserting this into the SLCAPM to reverse engineer an equity beta estimate (SFG recommends an equity beta of 0.91 under this approach).

SFG also submitted that transparency requires us to empirically estimate the Black CAPM, and that we have essentially computed an unspecified estimate of the zero-beta premium.[1600]

We disagree with SFG's views. Our view is that it is open to us to consider the theory underlying the Black CAPM in informing our equity beta estimate. We set our reasons for not empirically estimating the Black CAPM in step two of section 3.4.1 and appendix A. We also set out our reasons for using the theory underlying the Black CAPM to inform the equity beta point estimate in steps one and two of section 3.4.1. Our assessment of the merits and limitations of the Black CAPM leads us to give it an informative, not determinative, role in estimating the equity beta for the benchmark efficient entity.

We consider our approach is simple to understand:

- The theory underlying the Black CAPM implies that the Black CAPM may predict a higher return on equity than the SLCAPM for firms with a beta less than 1.0.
- We have regard to this theoretical information by selecting an equity beta above the best empirical estimate implied from Henry's 2014 report.
- The theory underlying the Black CAPM cannot indicate a quantitative adjustment to the equity beta. However, we use judgement to consider the evidence is not inconsistent with an equity beta towards the upper end of the range.

We also consider we are transparent about how we apply our approach above. We do not agree with SFG that transparency requires us to empirically estimate the Black CAPM and derive a quantitative adjustment to equity beta. We do not consider this approach appropriately reflects the merits and limitations of the Black CAPM. In his 2015 report, Partington supported our view, stating that:[1601]

[1599] 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*, 13 February 2015, p. 19.

[1600] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 23–24; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, p. 17.

[1601] Partington, *Report to the AER: Return on equity (updated)*, April 2015, p. 71.

we do not consider that the consultants' estimates of the Black model provide a basis for assessment of the magnitude of the beta adjustment.

D.5 Selection of range and point estimate

In this section we discuss the selection of our equity beta range and point estimate. We adopt an equity beta point estimate of 0.7 from a range of 0.4 to 0.7. We are satisfied that an equity beta of 0.7 is reflective of the systematic risk a benchmark efficient entity is exposed to in providing regulated services.

Our decision on equity beta, after analysing all the relevant information before us, is consistent with the Guideline. This has the benefit of providing certainty and predictability for investors and other stakeholders. We also note that we received extensive support for the Guideline approach and application in stakeholder submissions.[1602]

D.5.1 Selection of range

Our equity beta range is based on the empirical evidence in Henry's 2014 report, as well as a number of other empirical studies based on Australian energy network firms (see section D.2). More specifically, our range is based on the average of individual firm estimates and fixed weight portfolio estimates from a range of different regression permutations.

We are satisfied the empirical studies considered show an extensive pattern of support for an empirical equity beta within a range of 0.4 to 0.7. However, in his 2014 report, Henry reported a range of 0.3 to 0.8. This range was based on:[1603]

> the majority of evidence presented in this report, across all estimators, firms and portfolios, and all sample periods considered,

1602 Submissions supporting the Guideline approach and/or November 2014 draft decisions, which applied the Guideline approach. AGL, *Submission to Energex's regulatory proposal for 2015–20*, 30 January 2015, p. 16; Australian PV Institute, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 6; Origin, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 17; AGL, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2015, p. 14; Australian PV Institute, *Submission to SA Power Networks' regulatory proposal for 2015–20*, December 2014, p. 5; Business SA, *Submission to SA Power Networks' regulatory proposal for 2015–20*, January 2015, p. 30; Origin, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2015, p. 13; MEU, *Submission to TasNetworks' revised revenue proposal and AER draft decision for 2014–19*, February 2015, pp. 56–57; Origin, *Submission to TransGrid's revised revenue proposal and AER draft decision for 2014–19*, 6 February 2015, pp. 5–6; ACAT, *Submission to ActewAGL's revised regulatory proposal and AER draft decision for 2014–19*, 20 February 2015, p. 1; AGL, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 3; ERAA, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 3; Origin, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, pp. 2, 14–15.

1603 Henry, *Estimating β: An update*, April 2014, p. 63.

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. As discussed in section D.2.2, we do not consider individual firm estimates in isolation as it is difficult to select an equity beta estimate from a particular comparator firm over a different estimate from another. Therefore, taking an average over all comparator firms is more likely to be reflective of the benchmark efficient entity. Considering equity beta estimates from various portfolios of comparator firms is also more likely to be reflective of the benchmark efficient entity because it combines the returns of various comparator firms.

Therefore, we base our equity beta range for the benchmark efficient entity on averages of individual firm estimates and fixed weight portfolio estimates. This is also consistent with regulatory precedent. It was the approach applied in the Guideline and in the 2009 WACC review.[1604] As demonstrated in sections D.2.3 and D.2.4, these estimates show a consistent pattern of support for an empirical equity beta range of 0.4 to 0.7 over:

- multiple estimation periods
- weekly and monthly return intervals (as well as four–weekly repeat sampling used by SFG)
- OLS and LAD estimation methods (as well as MM and Theil–Sen methods used by the ERA)
- different combinations of comparator firms.

This empirical range of 0.4 to 0.7 is also consistent with our conceptual analysis, which we use to cross check our empirical results (see section D.1). This is because our conceptual analysis suggests the systematic risks of a benchmark efficient entity would be less than the risks of a market average entity (that is, less than 1.0).

In its 2014 report for the NSW distribution network service providers, CEG proposed an equity beta range 0.82 to 0.94.[1605] The lower bound is based on SFG's empirical analysis using a comparator set of Australian and US energy firms and the upper bound is based on SFG's dividend growth model (DGM) estimate of relative risk ratios.[1606] CEG and SFG (in their 2014 reports) consider the equity beta range proposed in the Guideline:[1607]

[1604] AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 53; AER, *Review of the WACC parameters: Final decision*, May 2009, p. 342.

[1605] CEG, *WACC estimates*, May 2014, pp. 6–7.

[1606] CEG, *WACC estimates*, May 2014, pp. 6–7, 10, 19; SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013; SFG, *Alternative versions of the dividend discount model and the implied cost of equity: Report for Jemena Gas Networks, ActewAGL, APA, Ergon, Networks NSW, Transend and TransGrid*, 15 May 2014, pp. 57, 59.

[1607] SFG, *Equity beta*, May 2014, pp. 25–27; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 66–68; CEG, *WACC estimates*, May 2014, 6–11.

1. is arbitrary and meaningless, as it does not encompass the range of individual firm estimates
2. is based on one source of unreliable evidence (Australian empirical analysis), which pre-emptively dilutes or eliminates the impact of other relevant evidence
3. does not account for 'low beta bias' in the SLCAPM.

In regards to CEG and SFG's view that our range is arbitrary and meaningless, our equity beta range is based on averages of individual firm estimates and fixed weight portfolio estimates in Henry's 2014 report and other empirical studies (see sections D.2.3 and D.2.4). It does not represent the range of individual firm equity beta estimates. We note that SFG also presents its empirical equity beta estimates as averages of individual firm estimates and equal–weighted index estimates.[1608]

CEG and SFG's second and third points are interconnected with our selection of the equity beta point estimate. Therefore, we discuss these points in section D.5.3.

In its 2015 reports for several service providers, SFG again submitted that our range is based on one source of unreliable evidence (Australian empirical analysis), which pre-emptively dilutes or eliminates the impact of other relevant evidence.[1609] We do not agree with this submission, for the reasons discussed in section D.5.3.

D.5.2 Selection of point estimate

We consider the evidence in Henry's 2014 report suggests a best empirical equity beta estimate of approximately 0.5 (see section D.2.3). However, there are additional considerations that inform our determination of the equity beta point estimate from within the range. In particular, we consider the following sources of additional information:

- Empirical estimates of international energy networks—the recent international empirical estimates we consider range from 0.3 to 1.0.[1610] The pattern of international results is not consistent and there are inherent uncertainties when relating foreign estimates to Australian conditions. However, generally, we consider the international empirical estimates provide some limited support for an equity beta point estimate towards the upper end of our range (see section D.3).
- The theoretical principles underpinning the Black CAPM—for firms with an equity beta below 1.0, the Black CAPM may predict a higher return on equity than the SLCAPM. We consider this information points to the selection of an equity beta point estimate above the best empirical estimate implied from Henry's 2014 report.

[1608] SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, pp. 13–15.

[1609] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 6–9, 26–28; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, p. 27; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 19.

[1610] The upper bound of this range increases to 1.3 if we consider the additional Damodaran estimates SFG submitted in its 2015 report (see section D.3).

However, we do not consider the theory underlying the Black CAPM warrants a specific uplift or adjustment to the equity beta point estimate.[1611] The theory underlying the Black CAPM is qualitative in nature, and we are satisfied that this information is reasonably consistent with an equity beta point estimate towards the upper end of our range (see section D.4).

Further, we are mindful of the importance of providing stakeholders with certainty and predictability in our rate of return decisions, which we consider is consistent with the achievement of the allowed rate of return objective. The Guideline was developed, in part, to provide regulatory certainty for stakeholders under the new rules framework, and allow for our decisions to be reasonably predictable. It was also developed following consultation and analysis. The AEMC and stakeholder submissions to the 2012 rule change process accepted these views.[1612] The final Guideline expanded on the draft Guideline to include input parameter estimates for our foundation model as of December 2013. We did this in response to submissions from stakeholders, particularly service providers, seeking greater certainty of process.[1613]

After taking these considerations into account, we adopt an equity beta point estimate of 0.7 for this decision, consistent with the Guideline. We consider this approach is reflective of the available evidence, and has the advantage of providing a certain and predictable outcome for investors and other stakeholders. We recognise the other information we consider does not specifically indicate an equity beta at the top of our range. However, a point estimate of 0.7 is consistent with these sources of information and is a modest step down from our previous regulatory determinations.[1614] It also recognises the uncertainty inherent in estimating unobservable parameters, such as the equity beta for a benchmark efficient entity.

Moreover, we consider an equity beta point estimate of 0.7 provides a balance between the views of service providers and other stakeholders. While many stakeholder submissions supported the application of the approach set out in the Guideline, the CCP and a number of other stakeholders consider that our equity beta

[1611] We also do not consider our use of this information implies there is bias in the return on equity estimates derived from the SLCAPM. Our considerations are supported by McKenzie and Partington and Handley in their 2014 and 2015 reports. See: McKenzie and Partington, *Report to the AER: Part A return on equity*, October 2014, p. 23; Handley, *Advice on the return on equity*, October 2014, pp. 10–12; Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 41–44; Handley, *Further advice in the return on equity*, April 2015, pp. 5–6.

[1612] AEMC, *Final rule determination*, November 2012, pp. 42–43, 45, 50. Additional support for these views was provided in stakeholder submissions on the Guideline material. See: 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.

[1613] AER, *Explanatory statement: Rate of return guideline*, December 2013, p. 51.

[1614] Since 2010, 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.

point estimate was set too high.[1615] For example, UnitingCare Australia submitted that:[1616]

> As with MRP, we believe that the range in values for β lie on a continuum between low figures that serve the best interests of consumers, and higher figures that will serve the best interests of investors and owners, but that will come at the expense of affordability. Again, we recommend the AER act in the best interests of consumers and select at the lower end of the range. Such a choice would be consistent with relatively low risk businesses in a relatively benign capital market, which is the current situation.

Conversely, many service providers have submitted that our equity beta point estimate has been set too low. They consider our approach dilutes or eliminates the impact of relevant information, and does not sufficiently correct for various possible biases in the SLCAPM (see section D.5.3).[1617]

1615 CCP, *Response to AER draft determination for TasNetworks and TasNetworks' revised revenue proposal*, 18 February 2015, p. 4; CCP, *Response to AER draft determination for TransGrid and TransGrid's revised revenue proposal*, 16 February 2015, p. 7; CCP, *Submission: AER draft TransGrid determination TransGrid revised revenue proposal*, 6 February 2015, p. 13; CCP, *Response to AER draft determination for re: ActewAGL regulatory proposal 2014–19*, February 2015, p. 24; CCP, *Submission to AER: Responding to NSW draft determinations and revised proposals from electricity distribution networks*, 2 January 2015, p. 46; CCIQ, *Submission to Energex's regulatory proposal for 2015–20*, 30 January 2015, p. 16; EUAA, *Submission to Energex's regulatory proposal for 2015–20*, 30 January 2015, p. 14; Alliance of Electricity Consumers, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 6; CCIQ, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 20; QCOSS, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 73; TEC, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, February 2015, p. 20; ECCSA, *Submission to SA Power Networks' regulatory proposal for 2015–20*, December 2014, p. 79; EUAA, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2014, p. 14; SACOSS, *Submission to SA Power Networks' regulatory proposal for 2015–20*, January 2015, p. 19; SAFCA, *Submission to SA Power Networks' regulatory proposal for 2015–20*, January 2015, p. 10; UnitingCare, *Submission to SA Power Networks' regulatory proposal for 2015–20*, February 2015, p. 33; TSBC, *Submission to TasNetworks' revised revenue proposal and AER draft decision for 2014–19*, February 2015, p. 30; EMRF, *Submission to TransGrid's revised revenue proposal and AER draft decision for 2014–19*, January 2015, pp. 11–12 (the EMRF's recommendation was for the AER to adopt 'the midpoint of any range of point estimates where there might be doubt' and then apply an overall level of conservatism to the final assessment of the allowed revenue); EUAA, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 17; PIAC, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 44.

1616 UnitingCare, *Submission to SA Power Networks' regulatory proposal for 2015–20*, February 2015, p. 33.

1617 For example, the service providers' consultants suggest that the SLCAPM underestimates the return on equity for stocks with an equity beta below 1.0 (low beta bias) and stocks with a high book-to-market ratio (or value stocks). See: NERA, *Return on capital of a regulated electricity network*, May 2014, p. 44; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 94–95; CEG, *WACC estimates*, p. 11. We also received the following submissions supporting an equity beta above 0.7 (excluding submissions by the service providers to their own review process): Citipower and Powercor, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 1; Jemena Limited, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 1; United Energy, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 1; Australian Gas Networks, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 1; SAPN, *Submission to first round of regulatory determinations under the new rules*, 6 February 2015, p. 1; ENA, *Submission to the ACT/NSW revised*

We consider an equity beta of 0.7 for the benchmark efficient entity is reflective of the systematic risk of a benchmark efficient entity is exposed to in providing regulated services.[1618] In determining this point estimate, we applied our regulatory judgement while having regard to all sources of relevant material. We do not rely solely on empirical evidence and we do not make a specific adjustment to equity beta to correct for any perceived biases in the SLCAPM. We also do not rely on empirical evidence from the Black CAPM, Fama French three factor model (FFM) or SFG's construction of the dividend growth model (DGM) (see appendix A–equity models and appendix B–DGM). We do not consider our use of the SLCAPM as the foundation model will result in a downward biased estimate of the return on equity for a benchmark efficient entity (see section A.3.1 of appendix A–equity models).

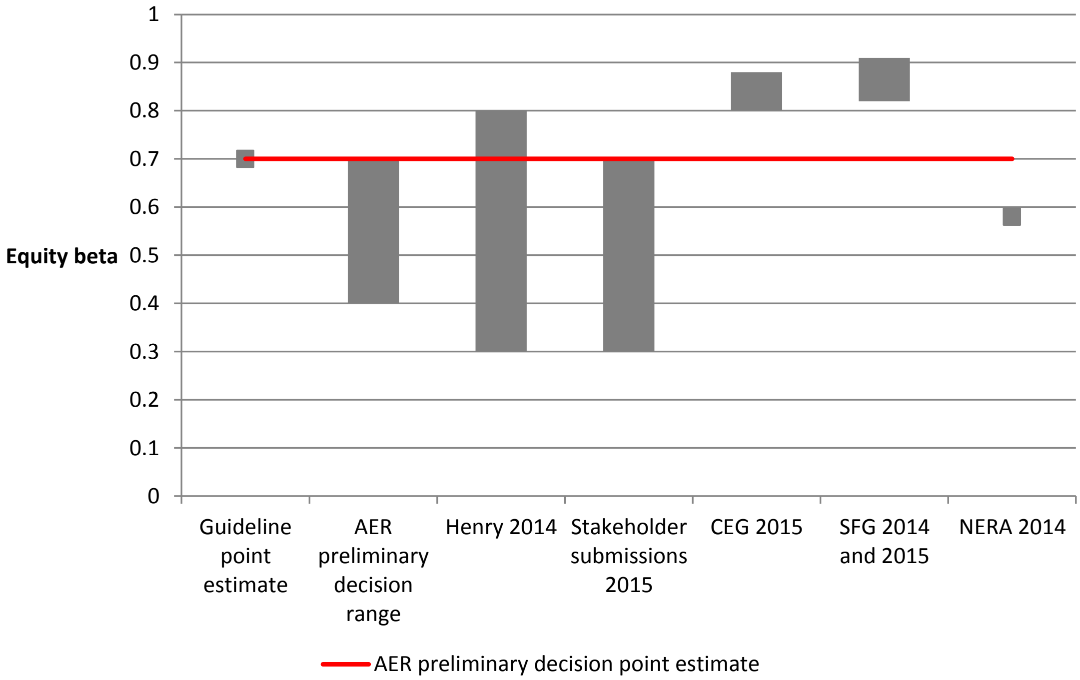
Our equity beta point estimate provides a balanced outcome, given the submissions by stakeholders and services providers. Figure 3-28 shows our point estimate and range in comparison with other reports and submissions. We are satisfied this outcome is likely to contribute to a rate of return estimate that achieves the allowed rate of return objective, and is consistent with the NEO/NGO and RPP.[1619]

regulatory proposals and AER draft decisions for 2014–19, 13 February 2015, p. 15; Ergon Energy, *Submission to the ACT/NSW revised regulatory proposals and AER draft decisions for 2014–19*, 13 February 2015, pp. 5–6; Ergon Energy, *Submission to TasNetworks' revised revenue proposal and AER draft decisions for 2014–19*, 13 February 2015, pp. 5–6; Ergon Energy, *Submission to TransGrid's revised revenue proposal and AER draft decisions for 2014–19*, 13 February 2015, pp. 5–6; TasNetworks, *Submission to the ACT/NSW revised regulatory proposals and AER draft decisions for 2014–19*, 12 February 2015, p. 2; Spark Infrastructure, *Submission to the NSW distribution network service providers' revised regulatory proposals and AER draft decisions for 2014–19*, 13 February 2015, p. 4.

1618 This benchmark efficient entity operates in Australia, by our definition. For this reason (and other reasons discussed in section D.2.1 and step two of section 3.4.1), we do not give a determinative role to international empirical estimates of equity beta.

1619 NER, cll. 6A.6.2(c) and 6.5.2(c); NGR, rule 87(2)(3); NEL, sections 7 and 7A; NGL, sections 23 and 24.

Figure 3-28 Submissions on the value of equity beta



Source: AER analysis[1620]

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 Alliance of Electricity Consumers' submission and the upper bound is based on Origin's submissions. The CEG 2015 range is based on adjustments to SFG's regression based estimates for the mining boom. The SFG 2014 and 2015 range lower bound is based on SFG'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's multiple model based equity beta estimates (under its alternative 'foundation model' approaches for the return on equity). The NERA 2014 point estimate is

[1620] 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; Alliance of Electricity Consumers, *Submission to Ergon Energy's regulatory proposal for 2015–20*, 30 January 2015, p. 6; Origin, *Submission to the Queensland distribution network service providers' regulatory proposal for 2015–20*, 30 January 2015, p. 17; Origin, *Submission to SA Power Networks' regulatory proposal for 2015–20*, 30 January 2015, p. 13; Origin, *Submission to the NSW distribution network service providers' revised regulatory proposals and the AER draft decisions for 2014–19*, 13 February 2015, p. 15; NERA, *Return on capital of a regulated electricity network*, May 2014, p. 79; CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 57–58. SFG submitted 0.82 (under multiple model approach for return on equity) in SFG, *Equity beta*, May 2014, p. 41; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 28; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 85; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 20; SFG, *The required return on equity for the benchmark efficient entity*, 12 March 2015, p. 20; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 4. SFG submitted 0.91 (under alternative 'foundation model' approaches for the return on equity) in SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 96; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, p. 88; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 35.

based on an equity beta of 0.58, which NERA used for its preferred specification of the SLCAPM (although NERA uses multiple models to estimate the return on equity).

In its 2015 reports, SFG submitted that our approach is inconsistent with the approach we used to estimate equity beta in the 2009 WACC review. SFG submitted that we selected a point estimate of 0.8 from a range of 0.4 to 0.7 in the 2009 WACC review because of the NEO/NGO and RPP. It considered these reasons apply equally today but are not mentioned in our November 2014 draft decisions, where we selected an equity beta point estimate of 0.7 from the same range.[1621]

We do not agree with SFG's view. During the Guideline process we stated:[1622]

> 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.

These reasons applied for the November 2014 draft decisions and continue to apply for this decision. We also note that we did mention the NEO/NGO and RRP in our November draft decisions.[1623]

D.5.3 Overall approach to estimating equity beta

We are satisfied that our approach to estimating the equity beta has regard to all sources of relevant material and determines a role for each source based on an assessment of its merits and limitations. We are also satisfied that an equity beta of 0.7 for the benchmark efficient entity is reflective of the systematic risk of a benchmark efficient entity is exposed to in providing regulated services. However, many service providers (and their consultants) submitted that our equity beta point estimate has been set too low. They consider our approach to estimating the equity beta (and the return on equity) dilutes or eliminates the impact of relevant information. This relevant information includes international empirical evidence and other models that the service

[1621] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 24–25; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, pp. 26–27.

[1622] 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.

[1623] See, for example: AER, *Draft decision: ActewAGL distribution determination 2015–16 to 2018–19—Attachment 3: Rate of return*, November 2014, p. 271. The other draft decisions contain similar references to the NEO/NGR and RRP.

providers consider can correct for possible biases in the SLCAPM.[1624] These service providers have proposed various alternative approaches to estimating the equity beta. These approaches place more reliance on the information we use to inform our point estimate and/or introduce new information, which in every case leads to the selection of a higher equity beta range and point estimate. Table 3-50 summarises the approaches adopted by the service providers and the corresponding consultant reports they have submitted.

Table 3-50 Service providers' proposed approaches to estimating the return on equity and equity beta

Service provider	Proposal	Revised proposal	Consultant reports
SAPN, Ergon Energy	Return on equity: layered approach—prefers multiple model approach, otherwise use alternative foundation model approach Equity beta: depends on return on equity approach—Australian and US empirical estimates (for multiple model approach), or multiple model approach (for alternative foundation model approach)	N/A[1625]	SFG[1626]
Energex	Return on equity: alternative foundation model approach Equity beta: multiple model approach	N/A[1627]	SFG[1628]

1624 The service providers' consultants have suggested that the SLCAPM underestimates the return on equity for stocks with an equity beta below 1.0 (low beta bias) and stocks with a high book-to-market ratio (or value stocks). See: NERA, *Return on capital of a regulated electricity network*, May 2014, p. 44; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 94–95; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 83–86; CEG, *WACC estimates*, p. 11.

1625 During the submissions process for the NSW/ACT/Tas service providers revised proposals and the AER November 2014 draft decisions, Ergon Energy submitted a number of consultant reports, including SFG, *Beta and the Black capital asset pricing model*, 13 February 2015 and SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015. SFG's 2015 Beta and the Black CAPM report recommended using empirical evidence from the Black CAPM to adjust the equity beta for the SLCAPM if our foundation model approach is adopted. This report did not refer to the other models submitted in Ergon Energy's initial proposal on equity beta (the FFM and SFG's construction of the DGM).

1626 SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014. SAPN also submitted SFG, *Equity beta*, May 2014.

1627 Energex submitted the same reports as Ergon Energy during its submission process, and also submitted SFG, *The required return on equity: Initial review of the AER draft decisions—Report for Energex*, 30 January 2015.

1628 SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014.

Service provider	Proposal	Revised proposal	Consultant reports
JGN, ActewAGL	Return on equity: layered approach—prefers multiple model approach, otherwise use alternative foundation model approach Equity beta: depends on return on equity approach—Australian and US empirical estimates (for multiple model approach), or multiple model approach (for alternative foundation model approach)	JGN—maintain layered approach[1629] ActewAGL—maintain layered approach, but only use Black CAPM to adjust equity beta under alternative foundation model approach[1630]	SFG[1631]
NSW DNSPs	Return on equity: multiple model approach for range, historical CAPM for point estimate Equity beta: multiple model approach for range, Australian and US empirical estimates for point estimate	Return on equity: appears to be the same as proposal[1632] Equity beta: no range specified, Australian and US empirical estimates for point estimate[1633]	CEG, SFG[1634]

[1629] In its revised proposal, JGN reiterated the layered approach from its initial proposal. However, JGN also submitted SFG's 2015 Beta and the Black CAPM report, which recommended using empirical evidence from the Black CAPM to adjust the equity beta for the SLCAPM if our foundation model approach is adopted. This report did not refer to the other models submitted in JGN's initial proposal on equity beta (the FFM and SFG's construction of the DGM). See: JGN, Revised access arrangement proposal, February 2015, p. 14; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 35.

[1630] ActewAGL did not directly refer to any alternative foundation model approach in its revised proposal. However, it submitted an equity beta range 0.82–0.91 and submitted SFG's 2015 Beta and the Black CAPM report, which recommended using empirical evidence from the Black CAPM to adjust the equity beta for the SLCAPM to 0.91 if our foundation model approach is adopted. See: ActewAGL, *Revised regulatory proposal*, January 2015, p. 450; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 35.

[1631] Submissions made post draft decision: SFG, *Beta and the Black capital asset pricing model*, 13 February 2015; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015. ActewAGL also submitted SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015.

[1632] However, there are some inconsistencies between the NSW DNSPs' revised proposals and SFG's 2015 report, which estimates the MRP and return on equity using the NSW DNSPs' proposed risk free rate averaging period. SFG used a weighted average method to determine its MRP and return on equity estimates, which is different to the approach applied in the NSW DNSPs' revised proposals. See: SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, pp. 42–43; Ausgrid, *Revised regulatory proposal*, January 2015, p. 188.

[1633] However, the NSW DNSPs also submitted SFG's 2015 Beta and the Black CAPM report, which recommended using empirical evidence from the Black CAPM to adjust the equity beta if our foundation model approach is adopted (SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, p. 35).

[1634] Submissions made post draft decision: CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015; SFG, *Beta and the Black capital asset pricing model*, 13 February 2015; SFG, *The required return on equity for the benchmark efficient entity*, 12 March 2015; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015.

Service provider	Proposal	Revised proposal	Consultant reports
TransGrid	Return on equity: multiple model approach Equity beta: Australian empirical estimates	Same as proposal	NERA[1635]
TasNetworks, Directlink	Guideline approach	Draft decision approach	

Source: Proposals, revised proposals and consultant reports submitted by the service providers.

In their 2014 reports, SFG, CEG and NERA (the consultants) all submitted that they disagreed with our approach to estimating the equity beta. In summary:

- SFG submitted that we use a multi–stage approach that pre-emptively dilutes or eliminates the impact of other relevant evidence.[1636] It notes the other information we consider suggests a point estimate above the top of our range. SFG also submitted that if we do not use a multiple model approach to estimate the return on equity, we should use the models to estimate the equity beta for the SLCAPM.[1637] It considered our foundation model approach to estimating the return on equity (with an equity beta of 0.7) does not sufficiently correct for biases in the SLCAPM.[1638]
- CEG submitted that our approach does not give sufficient consideration to international empirical estimates of equity beta.[1639] CEG considered we should include a sample of 56 US energy firms in our domestic comparator set to increase the reliability of our equity beta estimates. CEG also submitted that our approach does not account for 'low beta bias' in the SLCAPM. It considered that to account for this we should give greater consideration to the Black CAPM or estimate beta using a different methodology.
- NERA submitted that, under our foundation model approach to estimating the return on equity, we have made an arbitrary and insufficient adjustment to equity beta to correct for biases in the SLCAPM.[1640]

1635 NERA, *Return on capital of a regulated electricity network*, May 2014. TransGrid maintained the approach and reasoning from its initial revenue proposal in its revised revenue proposal.

1636 SFG, *Equity beta*, May 2014, pp. 25–27; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 92–95; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 66–67, 72, 79, 83–89.

1637 SFG used four models: the SLCAPM, Black CAPM, FFM and its own construction of the DGM.

1638 SFG considers the SLCAPM produces downward biased estimates of low beta stocks (stocks with an equity beta less than 1.0). This is what it refers to as 'low beta bias'. SFG also considers the SLCAPM underestimates the return on equity for high book-to-market stocks. See: SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 94–95

1639 CEG, *WACC estimates*, May 2014, pp. 7–20.

1640 NERA, *Return on capital of a regulated electricity network*, May 2014, pp. v–vi, 44, 64, 68–69.

We consider the consultants' key views on our approach to selecting the equity beta range and point estimate can be summarised as follows:

- We use a multi–stage approach that pre-emptively dilutes or eliminates the impact of other relevant evidence. The other relevant information suggests a point estimate above our range.
- Under the foundation model approach to estimating the return on equity, our estimate of equity beta does not sufficiently account for possible biases in the SLCAPM. The consultants consider there is evidence to suggest the SLCAPM underestimates the return on equity for firms with an equity beta below 1.0 and firms with high book-to-market ratios.

The consultants submitted that their approaches to estimating the return on equity and equity beta address both these considerations. We disagree with the views expressed by the consultants and explain our reasoning below.

On the consultants' first view, we note that our approach to determining the equity beta range and point estimate is designed such that we rely mostly on the evidence from our robust Australian empirical analysis and rely less on evidence we consider to be less useful for our regulatory task (international empirical estimates and theory underlying the Black CAPM). We implement this approach by using our Australian empirical evidence to determine the equity beta range, and restricting the other information to informing the point estimate within the empirical range. By contrast, we consider the approach applied by SFG does not give appropriate consideration to the merits and limitations of the available information.

On the consultants' second view, we do not make a specific adjustment to our equity beta point estimate to correct for perceived biases in the SLCAPM. We do not consider our use of the SLCAPM as the foundation model will result in a downward biased estimate of the return on equity for a benchmark efficient entity (see section A.3.1 of appendix A–equity models).[1641] We do consider there are market imperfections that affect the practical application of any model including the SLCAPM. These could lead to a SLCAPM estimate of the required return that differs from the (unobservable) actual required return on equity, and this is a relevant factor we have considered. It is important to note that all models with simplifying assumptions will be affected by market imperfections when they are applied in a practical setting. These include the Black CAPM, FFM and SFG's construction of the DGM. We provided a detailed response to NERA's submissions on this matter in our draft decision for TransGrid.[1642]

[1641] We also do not consider the evidence from the Black CAPM implies that the estimates produces from the SLCAPM are downward biased for low beta stocks (see section A.3.3). Additionally, we do not consider the service providers have provided us with commonly accepted evidence that a value factor is priced in the return on equity (see section A.3.2).

[1642] AER, *Draft decision: TransGrid transmission determination 2015–16 to 2017–18—Attachment 3: Rate of return*, November 2014, pp. 271–273.

Under its alternative 'foundation model' approach, SFG used empirical evidence from the SLCAPM, Black CAPM, FFM and its own construction of the DGM to estimate the equity beta.[1643] It submitted that in the Guideline we used evidence from the Black CAPM to reverse engineer an equity beta estimate that accounts for 'low beta bias'. Therefore, we should do the same in accounting for evidence of a value premium (FFM) and contemporaneous evidence from DGMs (SFG's DGM construction).[1644] In response to this, we note that we consider the equity beta for the benchmark efficient entity in the context of our foundation model, that is the domestic SLCAPM. Therefore, we do not discuss beta estimates that are implied from the empirical results of other models. We assess other models against the rate of return criteria in step two of our foundation model approach (see section 3.4.1). We consider the theoretical principles underpinning the Black CAPM when estimating equity beta but do not consider its empirical implementation. We only use DGM evidence to inform the range and point estimate of the MRP and do not use the FFM.

SFG's DGM based estimates of equity beta are derived by estimating the relative risk ratio of Australian energy network firms to the market.[1645] It calculates the equity risk premium for all Australian–listed firms using its own DGM construction to generate estimates of the implied MRP. SFG then compares this to equity risk premium estimates for Australian–listed energy network firms and generates a risk premium ratio of 0.94, which it uses as an implied equity beta estimate. We consider there are a number of problems with this approach to estimating beta, and these are discussed in section B.3 of appendix B–DGM.

In their 2015 reports, SFG and CEG again submitted that they do not agree with our approach to estimating the equity beta. Their views can be summarised as follows:

- CEG submitted that that our approach does not give sufficient consideration to international empirical estimates of equity beta. CEG considered we should include a sample of 56 US energy firms in our domestic comparator set to increase the reliability of our equity beta estimates.[1646] However, CEG did not mention 'low beta bias' in the SLCAPM.
- SFG submitted that we use a multi–stage approach that pre-emptively dilutes or eliminates the impact of other relevant evidence. SFG considered that we use 'primary' and 'secondary' sources of evidence to estimate equity beta. It submitted that the way we consider the 'secondary' sources of evidence means that they will never be persuasive enough to change the range implied by the 'primary' evidence. It considered that this effectively imposes a binding constraint of 0.4 to 0.7 on the equity beta point estimate. SFG's preferred approach is to use a multiple model

[1643] SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 94–96; SFG, *Estimating the required return on equity: Report for Energex*, 28 August 2014, pp. 76–78, 83–89.

[1644] CEG also used SFG's DGM construction to form the upper bound of its equity beta range. See: CEG, *WACC estimates*, May 2014, pp. 7, 19–20.

[1645] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, pp. 56–57.

[1646] CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015, pp. 33–34.

approach to estimate the return on equity, and use a comparator set of Australian and US energy firms to empirically estimate the equity beta for the SLCAPM.[1647] However, it considered that if the foundation model approach is to be adopted, empirical evidence from the Black CAPM should be used to adjust the equity beta estimate for use in the SLCAPM.

We again disagree with these views. We explained our reasoning for why we give different roles to different sources of relevant material above (and in steps one and two of section 3.4.1). We also explain why we do not include the sample of 56 US energy firms in our domestic comparator set in section D.2.1.

We also do not consider we have imposed a binding constraint on the equity beta point estimate. We use Australian empirical estimates to determine the equity beta range because we have the most confidence in this source of evidence (see steps one and two of section 3.4.1). We consider it is reasonable to expect that if there was a substantial and sustained increase in the equity beta for the benchmark efficient entity, then this would be reflected in the Australian empirical estimates we consider. We note that we consider different estimation periods in our analysis, so we do not rely solely on the longest historical estimation period. Also, as discussed above (and in steps one and two of section 3.4.1), we consider the theoretical principles underpinning the Black CAPM when estimating equity beta but do not consider its empirical implementation.

We are satisfied that our approach to estimating the equity beta has regard to all sources of relevant material and determines a role for each source based on an assessment of its merits and limitations. Based on the available evidence and submissions, we are satisfied that an equity beta of 0.7 for the benchmark efficient entity is reflective of the systematic risk of a benchmark efficient entity is exposed to in providing regulated services.

Additional issues—asymmetric risk

Additionally, in its proposal ActewAGL submitted that our comparator set of listed Australian energy network firms appears to face asymmetrical market risk. This means that the firms may be more exposed to market conditions during 'bad' (or down-market) times than during 'good' (or up-market) times. ActewAGL considers that investors will be aware of this and demand a higher return on equity to compensate for bearing higher exposure to down-market risk than up-market risk. ActewAGL submitted that:[1648]

> the return on equity implied by the single, symmetric equity beta model used by the AER, and its regression based beta estimate of 0.4 to 0.7, will typically

[1647] SFG, *Beta and the Black capital asset pricing model*, 13 February 2015, pp. 6–9, 25–28, 35; SFG, *The required return on equity for the benchmark efficient entity*, 13 February 2015, p. 19; SFG, *The required return on equity: Initial review of the AER draft decisions*, 19 January 2015, p. 27.

[1648] ActewAGL, *Regulatory proposal*, 2 June 2014 (resubmitted 10 July 2014), p. 264.

> undercompensate investors for the true risks which they bear and the required rate of return.

ActewAGL bases this consideration on a single diagram which appears to plot the returns of an equal weighted portfolio of five Australian energy network firms against the returns of a market index (ASX300). The diagram also shows an 'asymmetric fit' line, which may be based on two OLS regressions, one over the down-market part of the sample and the other over the up-market part of the sample. This would result in two different equity beta estimates, one for 'bad' (or down-market) times and one for 'good' (or up-market) times. However, we are not certain we have correctly interpreted ActewAGL's approach, as ActewAGL has not provided us with an explanation of how the asymmetric fit line has been derived, or even what the horizontal and vertical axes measure. There is also no mention of this issue in the consultant reports submitted with ActewAGL's proposal. Even if ActewAGL's approach is consistent with our understanding of split sample beta estimates, its proposal:

- does not establish the statistical significance of the equity betas estimated in the split sample, and whether the difference between the equity beta estimates is statistically significant
- does not cite any published empirical research in which their approach has been used, which means we do not know if it's a is a commonly accepted method
- does not cite an asset pricing model in which returns are determined by two distinct equity betas that correspond to up-market and down-market returns
- does not make any references to theoretical research supporting its claim that 'investors will demand a higher return on equity in order to compensate for the risk of down-market exposure that does not carry a corresponding up-side'.[1649]

For the above reasons, we did not accept ActewAGL's proposal that we adjust our equity beta estimate to account for asymmetrical risk in our November 2014 draft decision.

In its revised proposal, ActewAGL reiterated its views regarding asymmetric risk. The only evidence presented in its revised proposal is the following statement:[1650]

> ActewAGL Distribution also continues to consider that the equity beta is subject to asymmetrical risk. This point was raised in its regulatory proposal for the subsequent regulatory period and ActewAGL Distribution does not consider that the AER has provided any evidence to the contrary.

We disagree with this view and maintain our view from the draft decision. In his 2015 report, Partington considered this issue. He determined that there is no way to determine the joint and individual significance of the estimates of the regression equation ActewAGL may have used because neither parameter estimates nor

[1649] ActewAGL, *Regulatory proposal*, 2 June 2014 (resubmitted 10 July 2014), p. 264.
[1650] ActewAGL, *Revised regulatory proposal*, January 2015, p. 458.

standard errors are provided. Partington was unable to assess ActewAGL's submission that our comparator set of listed Australian energy network firms appears to face asymmetrical market risk because of the 'scant information provided'.[1651] However, Partington stated that:[1652]

> We note that Henry (2008, 2009, 2014) estimates a range of models consistent with (6) and finds no evidence of serial correlation in the residuals from these models. This is consistent with the view that there are no omitted variables such as Dt or Dt × RMt in those models and we take this evidence as suggesting that there is no such asymmetry.

Based on the available evidence and submissions, we do not accept ActewAGL's proposal that we adjust our equity beta estimate to account for asymmetrical risk.

[1651] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 21–22.
[1652] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, pp. 21–22.

E Other information – return on equity

In section 3.4.1 of Attachment 3 to our preliminary decision we noted the other information included in the Guideline or submitted by stakeholders as relevant material. This appendix sets out the other information we considered to inform overall return on equity. This appendix also responds to issues raised by stakeholders about the way to consider other information.

E.1 The Wright approach

We estimate the return on equity under the Wright approach using a range for the long term historical average return on the market. We use a range because the estimated return on the market will vary depending on the time period used.[1653]

Using the full beta range and data up to the 2014 calendar year end, return on equity estimates fall within a range of 5.53 to 9.66 per cent. Using only the beta point estimate from the top of the range, return on equity estimates fall within a range of 7.77 to 9.66 per cent.

We estimate this range using the following parameter estimates:

- a return on the market range of 10.0 to 12.7 per cent, based on historical returns on the market portfolio
- an equity beta range of 0.4 to 0.7, with a point estimate from the top of the range
- a prevailing risk free rate of 2.55 per cent, based on a 20 day averaging period commencing 9 February 2015 (see discussion on the risk free rate under step three).

Table 3-51 sets out our estimates of historical returns on the market portfolio. These historical estimates are calculated on the basis that dividends are valued at 60 per cent of their face value. That is, these use a theta of 0.6 ($\theta = 0.6$).

Table 3-51 Historical returns on the market portfolio when theta equals 0.6 (per cent)

Sampling period	Arithmetic mean (real)	Arithmetic mean (nominal)[(a)]
1883–2014	8.6	11. 3
1937–2014	7.3	10.0
1958–2014	8.9	11.6
1980–2014	9.9	12.7

1653 AER, *Explanatory statement: Rate of return guideline (appendices)*, December 2013, pp. 26–27.

Sampling period	Arithmetic mean (real)	Arithmetic mean (nominal)[(a)]
1988–2014	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 2012–2014 market data.

(a) Assuming an inflation rate of 2.5 per cent. Nominal figures calculated by the AER using the Fisher equation: 1+i=(1+r)×(1+π) where r denotes the real return, i denotes the nominal return and π denotes the inflation rate

Energex proposed an expected return on the market informed by SFG's estimate of the Wright approach.[1654] We agree with the following aspects of SFG's estimate under the Wright approach:

- Using a prevailing risk free rate averaged over 20 businesses days, consistent with the risk free rate used in the SLCAPM. However, we have used the averaging period that was agreed upon in advance (see discussion on the risk free rate under step three above).
- Normalising estimates using the Fisher equation and a historical inflation rate of 2.5 per cent.

However, we apply the Wright approach differently to SFG's approach because:

- SFG only applied the Wright approach to estimate the return on the market. Table 3-5 and Table 3-14 set out why we use the Wright approach at the return on equity level. To do so, we apply an equity beta point estimate of 0.7 from a 0.4 to 0.7 range. In a concurrent determination process, SFG submitted that we should apply our equity beta point estimate of 0.7 instead of the range of 0.4 to 0.7.[1655] Our equity beta point estimate of 0.7 is the estimate of equity beta that we consider is appropriate to use in our foundation model. The Wright specification of the CAPM is not our foundation model. As stated in step three, Australian empirical studies present equity beta estimates that converge on the range of 0.4 to 0.7, while we consider Henry's 2014 report suggests a best empirical equity beta estimate of approximately 0.5. 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 the evidence from the Wright approach 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 for the reasons set out above.

[1654] Energex, *Regulatory Proposal July 2015 to June 2020*, October 2014, pp. 156, 162; SFG, *Estimating the required return on equity*, Report for Energex, August 2014, pp. 32–37.

[1655] SFG, The required return on equity: Initial review of the AER draft decisions, Note for ActewAGL, Ausgrid, Essential Energy and Endeavour Energy, 19 January 2015, p. 31-32.

- We do not apply NERA's (2013) adjustment.[1656] As a result, SFG proposes a different estimate of historical market returns to us.[1657] We do not consider NERA's (2013) adjustment to early historical data to be robust and sufficiently justified (see appendix B–MRP).
- We use a range under the Wright approach, whereas SFG estimates the return on the market under the Wright approach as a point estimate using the longest time period available.[1658] We estimate a range under the Wright approach from the different averaging periods in Table 3-51. This recognises the estimated return on the market will vary depending on the time period used.[1659] This also recognises that each of these periods has its own merits and limitations (see appendix B–MRP). This is consistent with the Guideline. We do not consider Energex has explained why it departed from the Guideline by adopting a point estimate.

Applying our estimates, the return on equity falls within a range of 5.53 to 9.66 per cent using the full beta range. Using only the beta point estimate, the return on equity estimates fall within a range of 7.77 to 9.66 per cent.

E.2 Return on debt relative to the return on equity

In step two we considered the comparison between the return on equity and return on debt is relevant material that may inform our estimate of the expected return on equity. We consider that prevailing debt market conditions provide support for the view that:

- our estimated return on equity is not below efficient financing costs[1660]
- Energex'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 1.92 per cent.[1661] 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 3-29 shows the current and historical debt risk premium and our foundation model equity risk premium. Energex proposed an equity risk premium of 6.87 per cent.

[1656] NERA, *The market, size and value premiums*, June 2013.

[1657] SFG, *Estimating the required return on equity*, Report for Energex, August 2014, pp. 32–37.

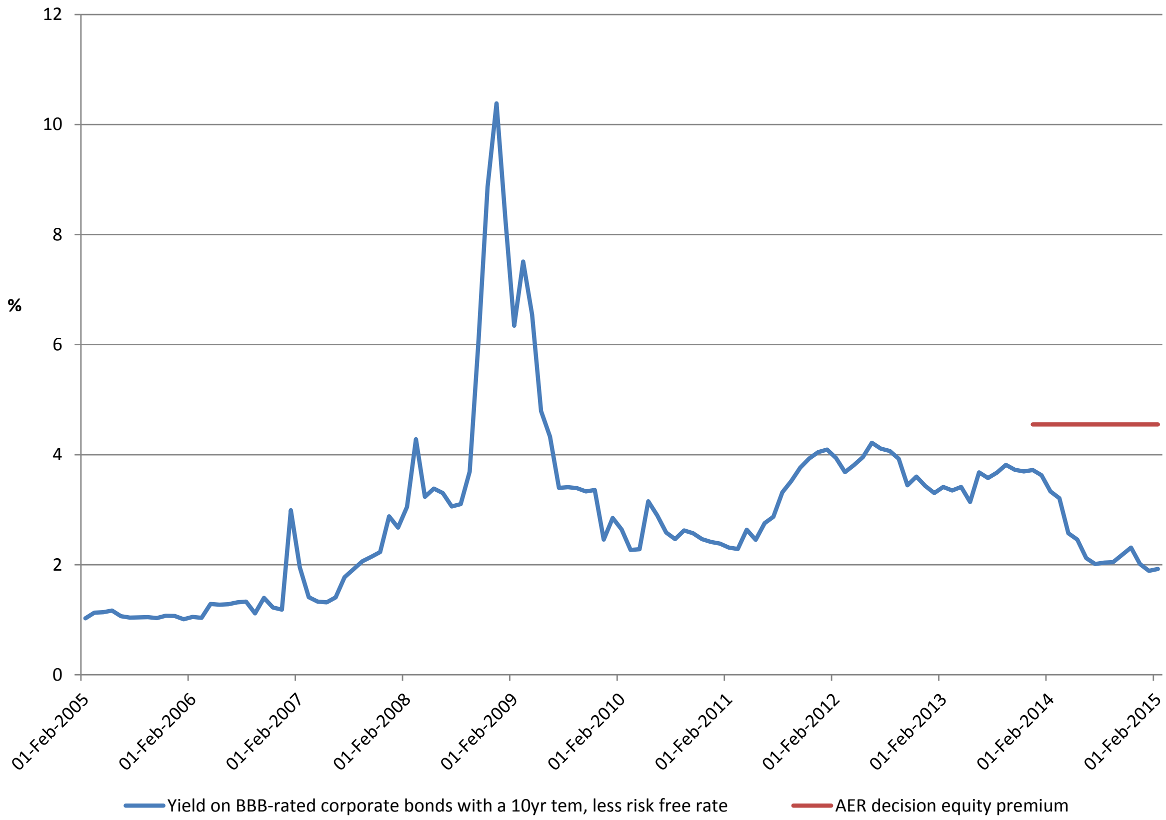
[1658] SFG, *Estimating the required return on equity*, Report for Energex, August 2014, pp. 32–37.

[1659] AER, *Explanatory statement: Rate of return guideline (appendices)*, December 2013, pp. 26–27.

[1660] 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).

[1661] Based on the RBA's monthly data (statistical table F3) for 28 February 2015 on yield to maturity on BBB-rated corporate bonds with a ten year term, specifically, the spread to CGS. RBA corporate bond data used for comparative purpose only. This is not reflective of our preliminary decision return on debt estimate which is calculated as an average of the RBA and Bloomberg (BVAL) data series and estimated by reference to BBB+ rated corporate bonds. In our preliminary decision we also make an extrapolation adjustment to the RBA data series.

Figure 3-29 Comparison of equity and debt premiums



Source: AER analysis, RBA F3 and F16 interest rates statistics

We do not consider that the current difference of about 260 basis points between the equity risk premium allowed in our preliminary decision and debt risk premiums[1662] to be too low, on the basis of:

- the low risk nature of a benchmark efficient entity as outlined above
- the current stabilising of debt risk premiums after a recent downward trend
- 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.[1663]

1662 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.

1663 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.

E.3 Independent valuation reports

We have focused on independent valuation reports that include a return on equity for companies that provide the closest comparison to a benchmark efficient entity. Table 3-52 outlines the range of return on equity and equity risk premium estimates from relevant independent valuation reports. However, we note that Table 3-52 includes a number of companies that are not substantially comparable to a benchmark entity as they are not similarly subject to our regulatory regime. 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.[1664]

The directional evidence from these reports tends to suggest:

- Equity risk premium ranges from 3.3 per cent to 5.4 per cent (without uplifts or adjustment for dividend imputation, 3.7 per cent to 11.7 per cent with uplifts and imputation adjustment).
- The AER's foundation model equity risk premium of 4.55 per cent (which includes the effect of dividend imputation) is within the range of estimates from valuation reports.
- The three most recent return on equity estimates from valuation reports (Hastings Diversified, DUET Group, and Envestra) explicitly include discretionary uplifts applied by the valuer. As discussed in section E.6 of appendix E–other information, we consider these discretionary uplifts applied by the valuer are likely for a purpose inconsistent with the allowed rate of return objective. We consider these return on equity estimates likely overstate the return on equity that would be comparable to our objective.
- The AER's foundation model equity risk premium sits lower in the imputation adjusted range from valuation reports. However, we note we have concerns that the adjustment for dividend imputation may not be appropriate (as outlined in section E.6 of appendix E–other information). 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 total risk premium above the risk free rate provided by the WACC estimates from the valuation reports ranges from 2.1 per cent to 4.8 per cent. Mid-points of the valuers' estimated total risk premium ranges are shown in Figure 3-30.[1665] Our

[1664] 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. Therefore, we do not consider that removing the risk free rate and examining the equity risk premium will bias the results.

[1665] The range of 2.1 to 4.8 extends from the minimum lower bound to the maximum upper bound of the valuers' ranges.

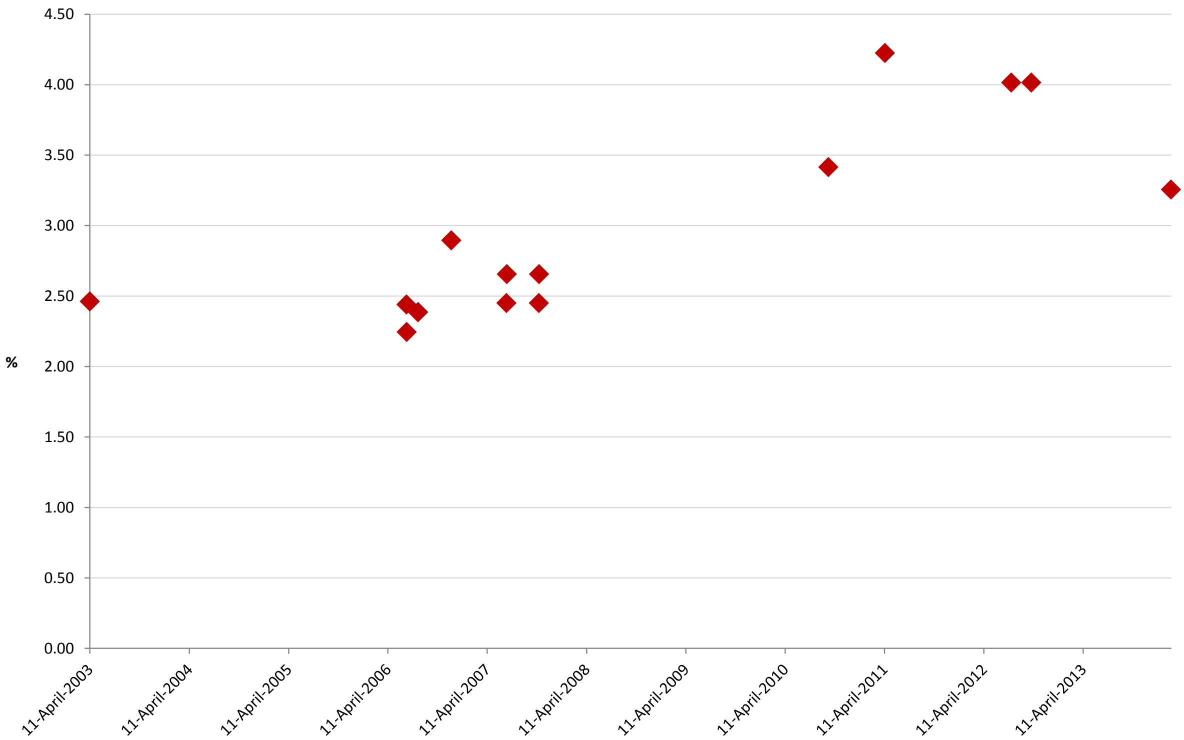
rate of return for Energex of 5.85[1666] per cent provides a total risk premium of about 3.3 per cent.

- The total risk premium from expert reports appears to have increased following the GFC, but also appears to be recently declining towards a level more in line with the total risk premium for this preliminary decision. However, caution should be exercised in drawing inferences from a small number of valuation reports.

We also 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 directional evidence from valuation reports.

Table 3-52 is based on only 18 independent valuation reports spanning a period going back to 1991.[1667] 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.

Figure 3-30 Total risk premium from relevant expert reports over time



[1666] Based on the return on debt for 2015–16.

[1667] The independent valuation reports were sourced from Thomson Reuters' Connect 4 database. This 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 included in table 3-20 of 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.

Source: AER analysis of reports from the Thomson Reuters Connect4 database

Notes: Total risk premium is the WACC less the risk free rate. We have shown the total risk premium based on a nominal vanilla WACC, expert reports using a different WACC form have been adjusted accordingly. We have also shown the vanilla WACC excluding any discretionary uplifts applied by the independent valuer. Grant Samuel's final WACC values for HDF, DUE, and ENV included discretionary uplifts.

Table 3-52 Range of estimates from relevant independent valuation (expert) reports

	Minimum	Maximum
Return on equity (without uplifts, without dividend imputation adjustment)	7.50	11.50
Return on equity (with uplifts, with dividend imputation adjustment)	8.98	14.67
Equity risk premium (without uplifts, without dividend imputation adjustment)	3.30	5.40
Equity risk premium (with uplifts, with dividend imputation adjustment)	3.72	11.67

Source: AER analysis of reports from the Thomson Reuters Connect4 database that are dated between 27 April 2013 and 28 February 2015.

The most (and only) recent report for a regulated energy network business is Grant Samuel's report for Envestra on 4 March 2014 (Grant Samuel). We find that this recent evidence does not support a move away from our foundation model estimate. We note that:

- Grant Samuel's initial SLCAPM-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). Our foundation model estimate of equity risk premium of 4.55 per cent.
- Grant Samuel outlined four separate uplift scenarios that supported its discretionary uplift to its rate of return above the initial SLCAPM-based estimate.[1668] Although we have concerns with the applicability of these uplifts to the allowed rate of return objective the equity risk premium range in three of the four scenarios[1669] is below our foundation model premium of 4.55 per cent.

Grant Samuel's submission in response to our November 2014 draft decisions makes a number of comments, of which two stand out. First, whether we should have used its pre-uplift SLCAPM-based return on equity along with its estimate including discretionary uplifts to set up the ERP range. As explained above and in Appendix A.6, we consider it reasonable to do so and it is not a case of 'cherry picking' by us as alleged by Grant Samuel. Second, whether all of the uplift should be allocated to the return on equity. In our November 2014 draft decision we noted that Grant Samuel

[1668] 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.

[1669] Without any adjustment for dividend imputation.

examined four scenarios before applying an uplift, but that the relative weight given by Grant Samuel to each scenario was unclear. One of the scenarios involved an uplifted risk free rate that would affect both return on equity and return on debt. Grant Samuel's valuation report for Envestra Ltd stated: [1670]

> Effective real interest rates are now low. We do not believe this position is sustainable and, in our view, the risk is clearly towards a rise in bond yields…On this basis, an increase in the risk free rate to (say) 5% would increase the calculated WACC range to 6.6-7.2%

When considering the return on equity ranges from Grant Samuel's Envestra report, we considered the range of possibilities from Grant Samuel's uplift scenarios. In its submission, Grant Samuel states "at no stage did we state that we assumed an uplift in risk free rates over time".[1671] We acknowledge that Grant Samuel did not assume that risk free rates would definitely increase, but note that Grant Samuel did consider the risk of this occurring.[1672] Grant Samuel's submission states "to the extent the risk free rate played a role, it was relatively minor".[1673] We note that the precise weight applied to the risk free rate scenario remains unclear. We consider that the approach applied in our November 2014 draft decisions remains open to us on the available evidence.

Even including discretionary uplifts, Grant Samuel's final estimate of Envestra's equity risk premium ranges from 4.3 per cent to 6.2 per cent.[1674] Our foundation model estimate of 4.55 per cent lies within this range. We note that the upper end of the range is likely over-stated, due to our concerns over adjusting for dividend imputation and uncertainty about the extent to which Grant Samuel's uplift to its rate of return should apply to the return on debt or the return on equity.[1675]

[1670] Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-Committee in relation to the Proposal By APA Group*, 3 March 2014, p. 89.

[1671] Grant Samuel & Associates Pty Ltd, *Australian Energy Regulator - Draft Decision*, 12 January 2015, p. 8.

[1672] Grant Samuel & Associates Pty Ltd, *Australian Energy Regulator - Draft Decision*, 12 January 2015, p. 6.

[1673] Grant Samuel & Associates Pty Ltd, *Australian Energy Regulator - Draft Decision*, 12 January 2015, p. 8.

[1674] Where the lower bound does not include any adjustment for dividend imputation and maximises the allocation of uplift to the return on debt, while the upper bound does include an adjustment for dividend imputation and allocates the entire uplift to the return on equity. For clarification, maximising the allocation of uplift to the return on debt assumes that the uplift is entirely in relation to the risk free rate scenario outlined by Grant Samuel. In this case, we have allocated the uplift to the risk free rate, which then increases both the return on equity and the return on debt, but does not allocate the entire uplift on the return on debt.

[1675] NERA submitted that Grant Samuel's final estimate of the equity risk premium, adjusted for dividend imputation, ranges from 6.3 per cent to 6.4 per cent (calculated as the return on equity range of 9.5 per cent to 9.6 per cent less Grant Samuel's risk free rate estimate of 4.2 per cent) [NERA, *Return on capital of a regulated electricity network*, May 2014, p. 112]. This is based on NERA's assumption of the whole amount of Grant Samuel's discretionary uplift applying to the return on equity. Grant Samuel submits that its DGM and risk premium scenarios are the 'primary' reasons for its uplift, indicating that the uplift is primarily to the return on equity [Grant Samuel & Associates, Grant Samuel Response to AER Draft Decision, January 2015, p. 6]. However, we consider there remains uncertainty about allocating uplift between debt and equity. Also, we do not consider that NERA's method for imputation adjustment is the most appropriate (if any adjustment is required). After adjusting for these factors, we find Grant Samuel's final equity risk premium to range becomes 4.9 per cent to 6.3 per cent.

Incenta Economic Consulting, in a report recently prepared for TransGrid, reviewed independent valuation reports recently released and submitted that:[1676]

- many independent valuation reports include an uplift to the return on equity above the valuer's initial SLCAPM-based estimate
- uplifts above initial SLCAPM-based estimates are on average higher for low beta businesses.

We note that the ranges for return on equity and equity risk premium estimates contained in Table 3-52 include the final values used in the independent valuation reports and reflect any uplifts applied. However, as noted in the return on equity appendix we have concerns about the applicability of these uplifts to the allowed rate of return objective.[1677] We also have concerns about the small sample size of relevant reports, as stated above. We note that the correction of a small number of errors in Incenta Economic Consulting's initial analysis resulted in material reductions in the average uplift from the sample.[1678] Further, we consider that there is greater benefit in observing comparable businesses than all businesses with low betas.

We consider that material uncertainty persists around the appropriate values. Therefore, it remains appropriate to report both adjusted and unadjusted values. Appendix E discusses further these issues.

Incenta Economic Consulting also submitted that independent valuers tend to estimate a more stable return on the market than the AER (over the sample period), and that this directional evidence should be considered.[1679] Section E.7 of Appendix E discusses this issue further. We examined independent valuation reports dated between 10 April 2013 and 28 February 2015. Overall, the market return estimated as the sum of the risk free rate and the AER's point estimate of the market risk premium is not inconsistent with the market returns estimated in valuation reports.[1680]

E.4 Broker reports

Table 3-53 shows the estimates of return on equity and premium above the risk free rate from broker reports between 1 October 2014 and 6 March 2015. As explained in step two, we have focused on those reports that include a return on equity for companies with non-diversifiable risks closest to those of a benchmark efficient entity. This sample includes a number of companies that are not substantially comparable to our benchmark entity as they are not similarly subject to our regulatory regime. We

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[1677] See Appendix E.6. 'Return on equity estimates from other practitioners' for more detail.

[1679] 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, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, p. 35.

[1680] 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.).

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.

Table 3-53 Recent broker reports

		Return on equity	Equity risk premium
Broker estimate—no imputation adjustment	Minimum	6.9	2.6
Broker estimate—no imputation adjustment	Maximum	11.2	5.2
Broker estimate—adjusted for imputation	Minimum	7.3	3.0
Broker estimate—adjusted for imputation	Maximum	12.0	6.0

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.

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. The proposed equity risk premium of Energex is above the range of premiums recently estimated by brokers.

As explained in step two, we use directional evidence from broker reports to inform our overall return on equity estimate. To observe directional changes in brokers' return on equity estimates, we have compared recent broker estimates to those we observed in our November 2014 draft decisions. Our analysis in our November 2014 draft decisions examined broker reports from August 2014 to September 2014.

Directionally, the range of equity risk premium estimates from broker reports has widened, at both its lower and upper bounds, since our review of broker reports in our November 2014 draft decisions,[1681] as shown in Table 3-54.[1682]

Table 3-54 Broker reports considered in November 2014 draft decisions

		Return on equity	Equity risk premium
Broker estimate—no imputation adjustment	Minimum	8.5	3.5
Broker estimate—no imputation	Maximum	9.9	4.9

1681 See: AER, *Draft decision: TransGrid transmission determination 2015–16 to 2017–18*, Attachment 3 - Rate of Return, November 2014, pp.142–143.

1682 See: 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, pp. 62–64.

		Return on equity	Equity risk premium
adjustment			
Broker estimate—adjusted for imputation	Minimum	9.1	4.1
Broker estimate—adjusted for imputation	Maximum	10.6	5.6

Source: AER analysis of broker reports by Credit Suisse, JP Morgan, and Macquarie Bank that include a valuation for AusNet Services, Spark Infrastructure, APA Group, and/or DUET Group.

E.5 Other regulators' decisions

Table 3-55 shows the estimates of return on equity and premium above the risk free rate from other regulators' decisions (dated between May 2013 and June 2014) that were examined in our November 2014 draft decisions.[1683] We have 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. As explained in step two, we have put more reliance on those decisions that include a return on equity for business comparable to the benchmark efficient entity. This means that greater reliance is placed on electricity and gas network service providers over other types of regulated businesses.

Table 3-55 Return on equity estimates from other regulators' decisions considered during our November 2014 draft decisions

Regulator	Decision	Date	Nominal vanilla return on equity	Equity risk premium
ERAWA	Draft decision: ATCO Gas	Oct 2014	6.80	3.85
ACCC	Final decision: State Water	Jun 2014	8.18	4.20
NTUC	Final decision: PWC Networks	Apr	8.31	4.20

[1683] ERA, *Draft decision on proposed revisions to the access arrangement for the Mid-West and South-West gas distribution system submitted by ATCO Gas Australia Pty Ltd*, 14 October 2014; ACCC, *Attachments to ACCC final decision on State Water pricing application 2014-15–2016-17*, 26 June 2014; Northern Territory Utilities Commission, *2014 Network Price Determination: Final Determination—Part A Statement of Reasons*, 24 April 2014; ESCV, *Price review 2013: Greater metropolitan water businesses—Final decision*, 25 June 2013; IPART, *Hunter Water Corporation's water sewerage stormwater drainage and other services: I July 2013 to 30 June 2017*, 11 June 2013; ESCOSA, *Final determination statement of reasons: State Water's water and sewerage revenues 2013/14–2015/16*, 27 May 2013.

Regulator	Decision	Date	Nominal vanilla return on equity	Equity risk premium
		2014		
ESCV	Final decision: Greater Metropolitan Water Businesses	Jun 2013	6.98–7.67	3.90
IPART	Final decision: Hunter Water Corporation	Jun 2013	7.56–10.2	3.30–6.08
ESCOSA	Final decision: SA Water	May 2013	8.05	4.8

Notes: For comparative purposes, all return on equity estimates have been converted to the post-company tax, pre-personal tax formulation consistent with the AER's foundation model.

The equity risk premium from the AER's 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 from more recent decisions from other regulators appears consistent with those examined in our November 2014 draft decisions, as shown in Table 3-56.[1684]

Table 3-56 Return on equity estimates from recent decisions of other regulators

Regulator	Decision	Date	Nominal vanilla return on equity	Equity risk premium
ACCC	Draft decision: Telstra's fixed line services	Mar 2015	6.70	4.20
ESCV	Consultation paper on proposed approach to Melbourne Water's 2016 price review	Feb 2015	NA	3.90
QCA	Draft decision: Gladstone Area Water Board price monitoring	Feb	6.54	4.16

[1684] Note that the risk characteristics of 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.

Regulator	Decision	Date	Nominal vanilla return on equity	Equity risk premium
	2015-20	2015		
IPART[a]	Fact sheet: WACC biannual update (Transport)	Feb 2015	10.17–10.30	5.40–7.47
IPART[a]	Fact sheet: WACC biannual update (Water)	Feb 2015	8.51–9.10	4.20–5.81
Tasmanian Economic Regulator	Draft report: 2015 price determination investigation: regulated water and sewerage services in Tasmania	Jan 2015	7.63	3.9
ERA	Revised draft decision: Review of the method for estimating the weighted average cost of capital for the regulated railway networks (Public Transport Authority)	Nov 2014	8.05	4.72
ERA	Revised draft decision: Review of the method for estimating the weighted average cost of capital for the regulated railway networks (Brookfield)	Nov 2014	10.65	7.32
ERA	Revised draft decision: Review of the method for estimating the weighted average cost of capital for the regulated railway networks (The Pilbara Infrastructure)	Nov 2014	15.61	12.28
ESCOSA	SA Water regulatory rate of return 2016–2020: draft report to treasurer	Nov 2014	7.67	4.80

Notes: For comparative purposes, all return on equity estimates have been converted to the post-company tax, pre-personal tax formulation consistent with the AER's foundation model.

[a] Calculated using IPART's supplied WACC model.

We now move to evaluating all the information including our foundation model estimate. In one sense, this is a sense check of the foundation model estimate. This provides us confidence that the return on equity estimate we determine will contribute to the achievement of the allowed rate of return objective.

E.6 Return on equity estimates from other practitioners

Our foundation model sets out our preliminary estimate of the return on equity for a benchmark efficient entity with comparable risks to Energex. Other market participants may, in the course of their operations, also produce return on equity estimates for entities similar to our benchmark entity. Evidence of return on equity estimates from other market participants is available from independent valuation (expert) reports, broker reports, and other regulators' decisions.

In the reasons for preliminary decision section, we considered there are a number of limitations on the use of this material in setting an allowed rate of return for a regulated business, which mean that the use of this material should be carefully considered. The main limitations are:

- broker reports and independent valuation reports have a different objective to the allowed rate of return objective, which may affect the return on equity estimates
- lack of transparency on how the return on equity estimates are derived
- return on equity estimates from other market participants may not be completely independent of our foundation model estimate, it may be misleading to place significant reliance on them as a cross-check
- return on equity estimates from other market participants are generally not directly comparable to our benchmark entity

These limitations are discussed further below.

TransGrid proposed using Grant Samuel's independent valuation of Envestra to directly inform the return on equity range.[1685] We do not consider that TransGrid's proposed role of valuation reports contributes to the achievement of the allowed rate of return objective given the limitations mentioned above. ActewAGL, Jemena Gas Networks, Energex, Ergon Energy, and SA Power Networks proposed using broker and valuation reports to inform estimates of the MRP.[1686] We note that consideration of the MRP estimates from broker and valuation reports is included in our consideration of the overall return on equity estimates from these reports (since the MRP is one component of the overall return on equity). Detailed assessment of the proposed approaches is also outlined below.

1685 TransGrid, *Revenue Proposal*, 2014/15–2018/19, p. 189.

1686 Energex, *2015-20 regulatory proposal*, October 2014, p. 162; Ergon Energy, *Regulatory proposal 2015 to 2020*, October 2014, pp. 132–133; SA Power Networks, *Regulatory proposal 2015-20*, October 2014, p. 318; Jemena Gas Networks, *2015-20 access arrangement information*, attachment 9.03, 5 June 2014, p. 17. In support of its proposal ActewAGL referred to a report prepared by SFG Consulting [ActewAGL, *Regulatory proposal*, (resubmitted 10 July 2014), p. 252]. For details, see: SFG Consulting, *The required return on equity for regulated gas and electricity network businesses*, Report for Jemena Gas Networks, ActewAGL Distribution, Ergon, and TasNetworks, 27 May 2014, p. 5–8, 74–79.

Differing objective

Valuers estimate a return on equity and overall rate of return to use as a discount rate to discount forecast cash flows. The discount rate (and return on equity) therefore must be related to the cash flows it is discounting. Notionally, the discount rate should reflect only the non-diversifiable risks faced by the business being valued. However, if the cash flows do not reflect all the diversifiable risks faced by the business being valued, the valuer may account for these risks by adjusting the discount rate.

For example, Grant Thornton in its report for Polymetals Mining stated that it increased its preliminary SLCAPM-based estimate of return on equity to account for:[1687]

> uncertainty associated with the early stage nature of the asset, risk associated with successfully converting mineral resources to ore resources, economic viability of extending the life of the mine, and higher technical and metallurgical recovery risk associated with Mt Boppy project due to pit mining of ore body at a greater depth compared to Marda project.

We consider that the type of risks discussed by Grant Thornton above are not systematic risks and therefore are not consistent with our application of the SLCAPM in the foundation model. The return on equity estimates from valuation reports may then not be valuable evidence in relation to the achievement of the allowed rate of return objective.

In response to our November 2014 draft decisions, Grant Samuel submitted that the use of uplift in their reports is unrelated to business-specific risk.[1688] We note that one of Grant Samuel's uplift scenarios was based on brokers' rate of return estimates.[1689] It is unclear what factors were underpinning the broker estimates relied on by Grant Samuel. In any case, Grant Samuel's submission, or any other submissions received, did not provide any new information about the uplifts applied by other independent valuers. We consider our concerns regarding uplifts by other independent valuers remains valid.

For valuations of regulated businesses, prevailing market expectations may be for the business to achieve cash flows worth well in excess of regulatory allowances. For cash flows from regulated activities, this may be done by outperforming regulatory allowances. The assumption of outperformance in future cash flows may be coupled with the use of a matching discount rate that is not entirely reflective of the true cost of capital.

[1687] Grant Thornton, *Polymetals Mining Ltd: Independent expert report and financial services guide*, 31 May 2013, p. 101.

[1688] Grant Samuel & Associates, *Grant Samuel Response to AER Draft Decision*, January 2015, p. 5.

[1689] Grant Samuel & Associates, Financial services guide and independent expert report to the independent board sub-committee in relation to the proposal by APA Group, 3 March 2014, p. 76.

Such expectations are reflected in a valuation greater than 1 times the RAB. Grant Samuel's valuation range in its March 2014 report for Envestra would have resulted in a transaction multiple of between about 1.34 and 1.46 times Envestra's RAB.[1690]

We consider that expectations of outperformance of regulatory benchmarks should be addressed by re-evaluating the level of the benchmarks. This means investigating the best estimates of individual parameters (credit rating, capital structure, equity beta, etc.) after consideration of recent performance by regulated businesses. It is arguably inconsistent with the allowed rate of return objective to determine our best estimates of individual parameters and also expect routine material outperformance of these benchmarks at the overall return on equity level. To the extent that return on equity estimates from broker and valuation reports reflect expectations of regulated cash flows in excess of regulatory allowances, placing significant reliance on these estimates may not provide a return on equity that contributes to the achievement of the allowed rate of return objective.

In addition, to reflect the permanent nature of many transactions, brokers and valuers often need to adopt a perpetuity timeframe when valuing a business and estimating a relevant return on equity. The estimated return on equity must then reflect the expectations of investors over this timeframe. Valuers' and brokers expectations of required rate of return over this timeframe may differ from the expectations embedded in the prevailing market data used to estimate SLCAPM parameters.[1691] Brokers and valuers may apply an uplift to account for these differences since their reports may be relied upon in making a permanent transaction. This is contrasted to determining a regulatory rate of return where the return on equity only applies for the length of the regulatory period (typically five years) and is updated at the start of the subsequent regulatory period.

For example, Deloitte in its report for RHG Ltd stated that it increased its preliminary SLCAPM-based estimate of return on equity because:[1692]

> While the return on Australian Government bonds has declined, we do not consider there is sufficient evidence to suggest that investors have reduced

[1690] Grant Samuel valued Envestra at between $4,122.1 million and $4,501.1 million [Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the proposal by APA Group*, 3 March 2014, p. 32.]. This valuation includes corporate cost savings in a takeover situation. Adding back these cost savings results in a valuation of $4,027 million to $4,378 million [Grant Samuel, *Grant Samuel Response to AER Draft Decision*, January 2015, p. 6].The combined projected (as at 1 March 2014) nominal RAB of Envestra's Victorian, South Australian, Albury, Wagga Wagga, and Brisbane gas distribution networks is about $3,006.4 million. We note Grant Samuel's submission that Envestra Ltd was in the middle of a substantial mains replacement program at the time of Grant Samuel's independent valuation report that would increase Envestra's RAB multiple over the short to medium term. We also note Grant Samuel's submission that its valuation of Envestra Ltd did not include expectations of outperformance of regulatory allowances. [Grant Samuel, *Grant Samuel Response to AER Draft Decision*, January 2015, p. 6]. We remain uncertain of the practices of other independent valuers.

[1691] For example, if a risk free rate estimate is based on yields on Government securities with a 10 year term-to-maturity, the yields may reflect market expectations of the ten year term, rather than perpetuity.

[1692] Deloitte, *RHG Limited: Independent Expert's Report and Financial Services Guide*, 5 November 2013, p. 62.

> their view of overall required returns. As such, the specific risk premium has been adjusted upwards to reflect this.

An uplift to account for a relatively low prevailing risk free rate is consonant with an expectation for the risk free rate to revert to long-term trend over the relevant timeframe (perpetuity).

In response to our November 2014 draft decisions, Grant Samuel submitted:[1693]

> it is our view that the relevant period is always a perpetuity, even in the context of a five year regulatory period. The rate of return over the five year period can only be realised if the capital value is sustained at the end of the period. The sustainability of the capital value at the end of year five is in turn dependent on cash flows beyond year five (i.e. the cash flows in perpetuity).

We note that:

- risks associated with cash flows beyond the regulatory control period are addressed in the determination of capex, opex, and depreciation allowances for the subsequent regulatory control periods
- in estimating an allowed return on equity we must have regard to the prevailing conditions in the market for equity funds.

The limitations set out above do not apply to return on equity estimates from other regulators' decisions.

Transparency

Greater transparency on how the market participant arrived at its return on equity estimate provides greater certainty that the estimate is reflective of well accepted and theoretically sound economic and finance principles. It also provides greater certainty on whether or not the estimate is consistent with the foundation model estimate and the allowed rate of return objective. All else equal, greater reliance should be placed on more transparent estimates and less reliance on less transparent estimates.

Other regulators' decisions are generally well supported with explanatory information. Recent broker reports for listed comparable companies have included only a simple list of the return on equity estimate and underlying SLCAPM parameters with no or limited supporting information. Independent valuation reports vary in the extent to which their estimates are supported with explanatory information. In general, valuation reports tend to provide more supporting information about the estimated rate of return than brokers' estimates, but there are still a number of information gaps.

An area of concern for broker and valuation reports is around accounting for dividend imputation. All of the valuation reports for comparator firms since 1999,[1694] and all the

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[1693] Grant Samuel, *Grant Samuel Response to AER Draft Decision*, January 2015, p. 5.

recent broker reports,[1695] appear to use a post-tax weighted average cost of capital with no explicit allowance for dividend imputation. Our return on equity estimate must account for Australia's dividend imputation system,[1696] therefore the return on equity estimates from broker and valuation reports may need to be increased for comparability.

However, we consider there is a lack of information in broker and valuation reports about the evidence and data sources used to arrive at initial estimates of market returns. Therefore, valuation reports contain only limited information on the extent to which their market risk premium estimates already reflect the value of imputation credits. For example, Grant Samuel in its report for Aquilla Resources states that its estimate of market risk premium "makes no explicit allowance for the impact of Australia's dividend imputation system"[1697] and that "the evidence gathered to date as to the value the market attributes to franking credits is insufficient to rely on for valuation purposes".[1698] Grant Samuel refers to Australian studies of the market risk premium that both include and exclude the impact of dividend imputation.[1699] Grant Samuel does not estimate the proportion of franking credits distributed to shareholders, the value of franking credits distributed, or the value of retained franking credits.[1700]

As noted by McKenzie and Partington, the full set of assumptions should be laid out before appropriate adjustments can be fully understood.[1701] We consider that there is insufficient information to support any precise adjustment for dividend imputation, reducing the comparability of broker and valuation estimates.

In response to our November 2014 draft decisions, Grant Samuel submitted:[1702]

> We have always made it clear in our reports that we do not believe that day to day market prices of Australian equities incorporate any particular value for

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1694 See Table 3-20 of AER, *Draft decision: TransGrid transmission determination 2015–16 to 2017–18*, November 2014.

1695 Equity markets research reports by JP Morgan, Macquarie, and Credit Suisse distributed to clients between 15 July 2014 and 30 September 2014.

1696 NER cl.6.5.2(d)(2) , NER cl.6A.6.2(d)(2), NGR r.87(2)(4)(b).

1697 Grant Samuel & Associates Pty Ltd, *Financial services guide and independent expert's report in relation to the takeover offer by Baosteel Resources Australia Pty Ltd and Aurizon Operations Ltd*, appendix 2, 20 June 2014, p. 6.

1698 Grant Samuel & Associates Pty Ltd, *Financial services guide and independent expert's report in relation to the takeover offer by Baosteel Resources Australia Pty Ltd and Aurizon Operations Ltd*, appendix 2, 20 June 2014, p. 15.

1699 Grant Samuel & Associates Pty Ltd, *Financial services guide and independent expert's report in relation to the takeover offer by Baosteel Resources Australia Pty Ltd and Aurizon Operations Ltd*, appendix 2, 20 June 2014, p. 4. Grant Samuel refers to an Officer study that examined data prior to the introduction of the imputation tax system in Australia in 1988.

1700 Grant Samuel & Associates Pty Ltd, *Financial services guide and independent expert's report in relation to the takeover offer by Baosteel Resources Australia Pty Ltd and Aurizon Operations Ltd*, appendix 2, 20 June 2014, p. 15.

1701 McKenzie & Partington, *Report to the AER: Part A Return on Equity*, 1 October 2014, p. 38; Partington, *Report to the AER: Return on Equity (updated)*, April 2015, p. 58.

1702 Grant Samuel, *Grant Samuel Response to AER Draft Decision*, January 2015, p. 5.

> franking credits attached to any future income stream and we have never made any adjustment for dividend imputation (in either the cash flows or the discount rate) in any of our 500 plus public valuation reports.

It is unclear whether the absence of 'any particular value' of imputation credits in market prices implies a belief that investors place no value on franking credits or if the value cannot be reliably determined. However, our concern extends further than Grant Samuel's views on market returns. Rather, our concerns are centred on the manner in which independent valuers consider various third-party MRP estimates and subsequently select a point estimate, potentially with the use of judgment and discretion. Third-party MRP estimates considered in valuation reports can include a mix of views on the value of imputation credits. In this case, it may be difficult to ascertain the relative impact of each third-party MRP estimate on the MRP estimate selected by the independent valuer.

In any case, the extent to which imputation credit value is reflected in other valuers' MRP estimates of valuers other than Grant Samuel remains ambiguous.

Independence

It is not clear that return on equity estimates from broker reports, valuation reports, and other regulators' decisions are completely independent from our own foundation model estimate, given the informative role of the AER guideline and the propensity for consensus among market participants.[1703]

For example, Grant Samuel in its report for DUET Group stated that it came to its beta estimate after:[1704]

> taking into account the ERA's October 2011 gas access arrangement decision for the Dampier Bunbury Pipeline (0.8) and the beta (0.8) adopted by the AER in its determination of the WACC for reset determinations for electricity distribution assets from May 2009 (e.g. in the recent determination for United Energy).

It may be erroneous to treat return on equity estimates from other market participants as entirely separate estimates against which our foundation model estimate can be compared. To give this material a direct role in determining the return on equity range, as proposed by TransGrid, could be to effectively double-count the importance provided to the material in a way that is potentially misleading.

[1703] Partington also noted the " there may be significant commonality (herding) in the cost of equity across reports by different firms" [Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 65].

[1704] Grant Samuel & Associates Pty Ltd, *DUET Group: Financial Services Guide and Independent Expert's report in relation to a Proposal to Internalise Management*, 3 October 2012, p. 26.

TransGrid's proposed role for the Envestra valuation report

TransGrid proposed using information from the single most recent independent valuation report: Grant Samuel's valuation of Envestra. TransGrid directly used the return on equity estimate from the Envestra valuation as one of four return on equity estimates that comprise TransGrid's proposed return on equity range.

We agree that the Grant Samuel valuation of Envestra is the most relevant individual valuation, as it is the most recent valuation for a business that we regulate. But we do not agree that significant reliance should be placed on the return on equity estimate from a single valuation report, or that it should be used to directly inform the allowed return on equity (for example, by being used in forming a return on equity range). Relying on evidence from a single valuation report materially increases the risk of introducing bias into the return on equity estimation process. As noted by Partington:[1705]

> Expertise, legal requirements and ethical behaviour on the part of expert valuers, increases the probability that expert reports would give unbiased estimates, but this is not guaranteed. Even when deliberate bias is eliminated, systematic errors in analysis can still give biased estimates.

We also consider that the limitations set out above of using valuation reports to determine a regulatory return on equity allowance remain present in relation to the Grant Samuel valuation of Envestra. In particular:

- The return on equity estimate is no longer timely, prevailing conditions in the market for funds have moved significantly since Grant Samuel's report.[1706]
- Grant Samuel's uplift to its initial SLCAPM return on equity estimate when deriving a final rate of return reflect the different purpose of an independent valuation report compared to a regulatory return on equity allowance. One of Grant Samuel's considerations contributing to the uplift is its view that the risk free rate at the time was abnormally low.[1707] While there is limited information in the Grant Samuel report, we consider the matter raised by Grant Samuel highlights the perpetuity timeframe required for a valuation used to inform a proposed take-over. Grant Samuel's valuation required estimating cash flows in perpetuity, and consequently its return on equity estimate needed to reflect expectations over the same timeframe. An uplift to account for an abnormally low prevailing risk free rate is consonant with an expectation for the risk free rate to revert to long-term trend over

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[1705] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 63.

[1706] Grant Samuel's independent expert report for Envestra is dated 3 March 2014 but the SLCAPM parameters estimated by Grant Samuel appear to have been estimated on 28 February 2014. As shown in the reasons for preliminary decision section, the risk free rate has decreased significantly in recent months.

[1707] In response to our November 2014 draft decisions, Grant Samuel submitted that its considerations of DGM estimates and risk premium issues were the 'primary' considerations for its uplift in its valuation report for Envestra Ltd. We note that the extent to which the uplift is influenced by Grant Samuel's risk free rate considerations remains ambiguous.

the relevant timeframe (perpetuity). Conversely, our return on equity estimate must have regard to the prevailing conditions in the market for equity funds. Given our purpose, it is less clear that Grant Samuel's uplifts and final return on equity estimate contributes to the achievement of the allowed rate of return objective.

- Grant Samuel's valuation range would have resulted in a transaction multiple of between about 1.34 and 1.46 times Envestra's RAB.[1708] A RAB multiple greater than one may indicate that the valuer and/or investors expect Envestra to achieve cash flows in excess of regulatory allowances. It is not clear that incorporating such expectations into our return on equity estimate is consistent with the allowed rate of return objective.
- There is not full transparency on how Grant Samuel came to its estimates, which can create difficulties for integrating Grant Samuel's estimates with our foundation model estimate or estimates from other stakeholders. This issue is especially pertinent for any adjustment for dividend imputation. Grant Samuel's rate of return estimate does not make any explicit adjustment for dividend imputation.[1709] TransGrid increased Grant Samuel's return on equity estimates to account for dividend imputation.[1710] However, we are uncertain whether or not an adjustment is or is not required based on Grant Samuel's MRP estimate, or the appropriate form of any adjustment.[1711]

ActewAGL's, JGN's, Energex's, Ergon Energy's, and SA Power Networks' proposed role for valuation reports

Energex, Ergon Energy, SA Power Networks, ActewAGL, and Jemena Gas Networks all proposed using independent valuation reports to inform estimates of market risk premium.[1712] In its report prepared for these NSPs, SFG states:[1713]

[1708] Grant Samuel valued Envestra at between $4,122.1 million and $4,501.1 million [Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the proposal by APA Group*, 3 March 2014, p. 32.] This valuation includes corporate cost savings in a takeover situation. Adding back these cost savings results in a valuation of $4,027 million to $4,378 million [Grant Samuel, *Grant Samuel Response to AER Draft Decision*, January 2015, p. 6]. We also note Grant Samuel's submission that Envestra Ltd was in the middle of a substantial mains replacement program at the time of Grant Samuel's independent valuation report that would increase Envestra's RAB multiple over the short to medium term [Grant Samuel, *Grant Samuel Response to AER Draft Decision*, January 2015, p. 6].

[1709] Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the proposal by APA Group*, 3 March 2014, p. 90.

[1710] TransGrid, *Revenue Proposal*, 2014/15–2018/19, p. 190.

[1711] If Grant Samuel's return on equity estimate for Envestra is to be adjusted to account for dividend imputation based on the information available in the valuation report, we do not support the adjustment used by NERA and TransGrid. Rather, we consider that a more appropriate adjustment method is to adjust the Grant Samuel's market risk premium estimate by the approach used to adjust for dividend imputation in our DGM.

[1712] Energex, *2015-20 regulatory proposal*, October 2014, p. 162; Ergon Energy, *Regulatory proposal 2015 to 2020*, October 2014, pp. 132–133; SA Power Networks, *Regulatory proposal 2015-20*, October 2014, p. 318; Jemena Gas Networks, *2015-20 access arrangement information*, attachment 9.03, 5 June 2014, p. 17. In support of its proposal ActewAGL referred to a report prepared by SFG Consulting [ActewAGL, *Regulatory proposal*, (resubmitted 10 July 2014), p. 252].

> In our view these reports provide relevant evidence which, if relegated to the final cross-check stage of the estimation process, is unlikely to ever receive any real weight.

We do not agree that use of relevant material to inform the overall return on equity (rather than to inform individual SLCAPM parameters) in and of itself will result in little weight being placed on that material. For example, in considering the role of dividend growth models we note that SFG's dividend growth model provides a return on equity for regulated NSPs in excess of the historical return on the market, which seems implausible. In this case, material on historical market returns has a quite significant consequence when used as a cross-check on the return on equity estimates from dividend growth models as we are unlikely to accept return on equity estimates in excess of expected returns to the market as a whole.

In practice, the reasons why a certain material may be used to inform the overall return on equity may simultaneously be reasons for limiting the reliance placed on that material. For example, some broker reports specify a return on equity estimate but do not specify all the parameters used to derive the return on equity estimate. In this case, the absence of parameter information requires use of the material at the overall return on equity level, but the lack of transparency on the derivation of the estimate may also be cause for caution in using parameter-level information.

As noted above, independent valuation reports often include uplifts to the return on equity or overall rate of return to account for risks not addressed in the cash flow forecasts. These uplifts may be made to the overall return on equity or overall rate of return, making it difficult to distil the final individual parameter estimate. This is acknowledged by SFG:[1714]

> we notes that certain assumptions must be made when seeking to extract an appropriate MRP estimate from an independent expert report (in particular, the extent to which various uplift factors should be incorporated into the MRP estimate).

We do not accept SFG's views that it is beneficial to make the assumptions highlighted by SFG when taking MRP estimates from valuation reports given overall return on equity estimates from these reports will be used to inform our overall return on equity estimate. In any case, we note that the MRP estimates from valuation reports accords with the other survey evidence of the MRP (see reasons for preliminary decision section).

[1713] SFG Consulting, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon, and TasNetworks*, 6 June 2004, p. 72.

[1714] SFG Consulting, *The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL Distribution, Ergon, and TasNetworks*, 6 June 2004, p. 7.

E.7 Incenta's review of valuation reports

In a report for Energex, Incenta Economic Consulting (Incenta) analysed return on equity estimates from valuation reports dated between 10 October 2012 to 31 January 2015.[1715] Incenta's report states that:

- the SLCAPM does not appear to fully capture the systematic risk (as considered by independent valuers) of businesses with a low equity beta, such as regulated energy networks;[1716] and
- independent valuers tend to estimate a more stable return on the market than the AER (over the sample period), indicating there is an inverse relationship between the risk free rate and market risk premium.[1717]

These two issues are further discussed in the subsections below.

Incenta's report also states that "the AER omitted [in its November 2014 draft decisions] to discuss in detail the many concerns that independent experts have raised about the shortcomings of the SLCAPM model".[1718] Our November 2014 draft decisions noted that there are limitations to the SLCAPM.[1719] We also noted the prevalence of the SLCAPM in recent valuation reports.[1720] In all the reports we examined,[1721] only one did not use the SLCAPM. All other reports used the SLCAPM 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 SLCAPM. 10 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

1715 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, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015.

1716 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, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, pp. 31–32.

1717 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, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, p. 35.

1718 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, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, p. 18.

1719 AER, Draft Decision: ActewAGL, Attachment 3, November 2014, pp. 159-167.

1720 AER, Draft decision: ActewAGL, Attachment 3, November 2014, pp. 165, 177.

1721 In the November draft decisions we independent expert reports dated between 27 April 2013 and 31 July 2014 and that contained a discounted cash flow analysis. We have since updated our analysis to include repots dated up to 28 February 2015.

independent valuation reports supports our view that the SLCAPM is the clearly superior model to use as the foundation model.

Evidence of equity premiums and return on the market

Incenta submits that independent valuers tend to increase equity risk premium in the face of material decreases in the risk free rate.[1722] Incenta plots equity risk premium against the risk free rate and states 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”. [1723]

We note that there is mixed evidence of any relationship between risk free rate and equity risk premium.[1724] However, 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 premiums. Commenting on Incenta's plot of equity risk premia from valuation reports (Figure 3.2 in Incenta's report), Partington state that "making reliable inference in a sample of 13 observations is extremely difficult", and "the inference in the report is highly speculative at best".[1725]

Figure 3-31 below shows the same style of analysis as that used in Figure 3.2 of Incenta’s report, however we have also added debt risk premiums. For the data shown in Figure 3-31, it is not clear whether any inverse correlation between risk free rate and equity risk premium is actually reflecting a positive correlation between equity risk premium and debt risk premium. As discussed in step four, although the risk free rate has recently declined, debt risk premiums have also decreased over the past year.

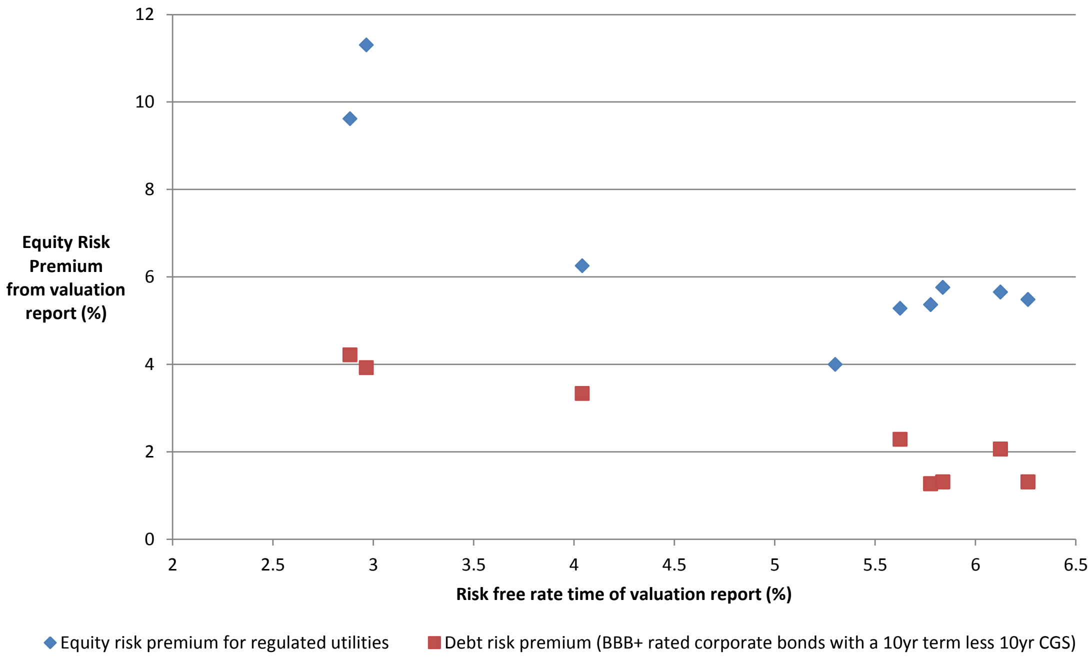
[1722] Incenta Economic Consulting, *Further update on the required return on equity from independent expert reports*, Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, AusGrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, p. 18.

[1723] 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, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, p. 19.

[1724] 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.

[1725] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 28.

Figure 3-31 Correlation between equity risk premium and risk free rate



Source: AER analysis of data sourced from the Thomson Reuters Connect 4 database

We also note that the sample size is small and each data point (valuation report) is for a different business. Therefore, differences in the valuer's equity beta estimate could drive differences in equity risk premium rather than movements in the risk free rate. Overall, we consider that there is insufficient data to draw accurate inferences in any direction.

Incenta submits that there is merit in examining directional evidence on the return on the market estimates from valuation reports.[1726] 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 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:[1727]

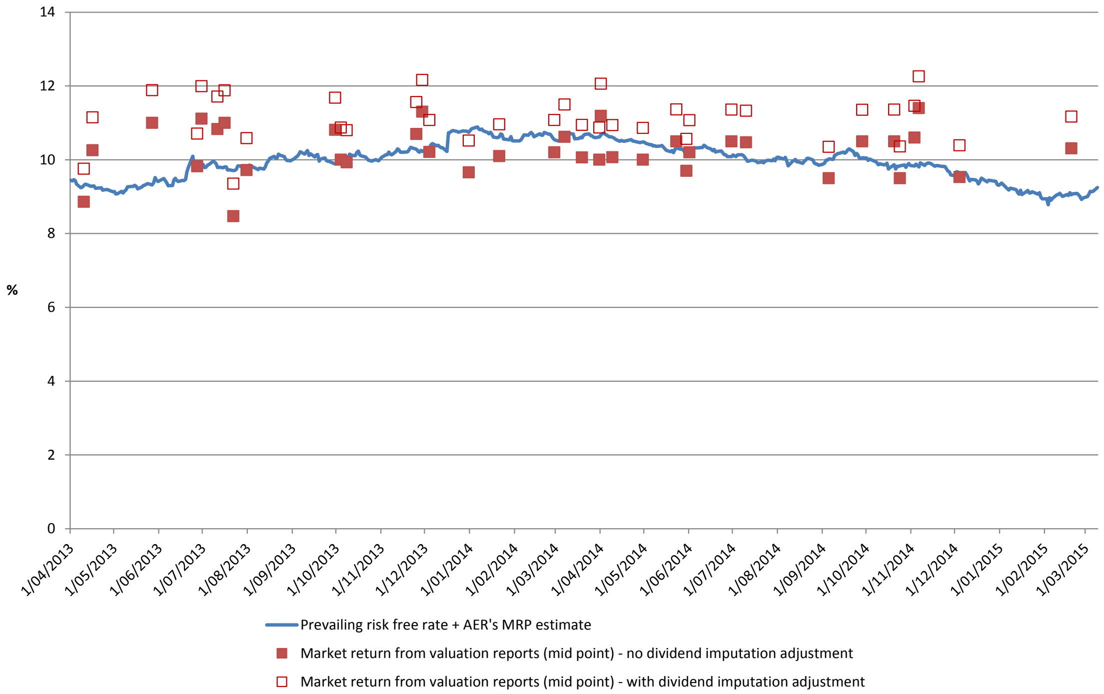
> Variation through time, however, needs to be interpreted with caution given our comments about the size of year by year samples below and possible changes in the representativeness of the sample through time.

[1726] 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, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, p. 33.

[1727] Partington, *Report to the AER: Return on equity (Updated)*, April 2015, p. 64.

Figure 3-32 shows the return on the market estimated in valuation reports dated between 10 April 2013 and 28 February 2015.[1728] Overall, Figure 3-32 shows that the market return estimated by the SLCAPM using the AER's point estimate of the market risk premium is not inconsistent with the market returns estimated in valuation reports.[1729]

Figure 3-32 Market return from valuation reports



Source: AER analysis of data sourced from the Thomson Reuters Connect 4 database

Evidence of return for low beta companies

Incenta examines nine valuation reports by one valuer, Grant Samuel, and concludes that there is evidence that valuers uplift their return on equity estimates (above an initial SLCAPM-based estimate) to a larger extent for businesses with a relatively low

[1728] Any uplifts (above the initial SLCAPM estimate) applied by the valuer to the return on equity or overall return on capital are not included in the market return. See section E.1. for a discussion on our preferred treatment of such uplifts. Of the 48 return on equity estimates in valuation reports between 10 April 2013 and 28 February 2015, 25 estimates included an uplift above the SLCAPM-based estimate. We consider only one of these uplifts to be expressly related to a low risk free rate—Deloitte's report for RGH Ltd on 5/11/2013, in which Deloitte stated "While the return on Australian Government bonds has declined, we do not consider there is sufficient evidence to suggest that investors have reduced their view of overall required returns. As such, the specific risk premium has been adjusted upwards to reflect this" [Deloitte, *Independent Expert's Report and Financial Services Guide* , 5 November 2013, p. 62].

[1729] 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.).

equity beta.[1730] We do not consider this evidence to be persuasive, for the following reasons:

- 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 (AIF).
- Analysis of only one valuer creates elevated risk of bias, although we note–as mentioned by Incenta[1731]–that Grant Samuel is well-respected within the industry.
- There were 24 valuation reports[1732] dated between 10 April 2013 and 28 February 2015 that included an uplift above the initial SLCAPM-based return on equity estimate (including 6 reports by Grant Samuel that were analysed by Incenta).
    - None of these reports explicitly mentioned low-beta bias or the Black CAPM as a reason for an uplift.[1733]
    - 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, as shown in Figure 3-33.

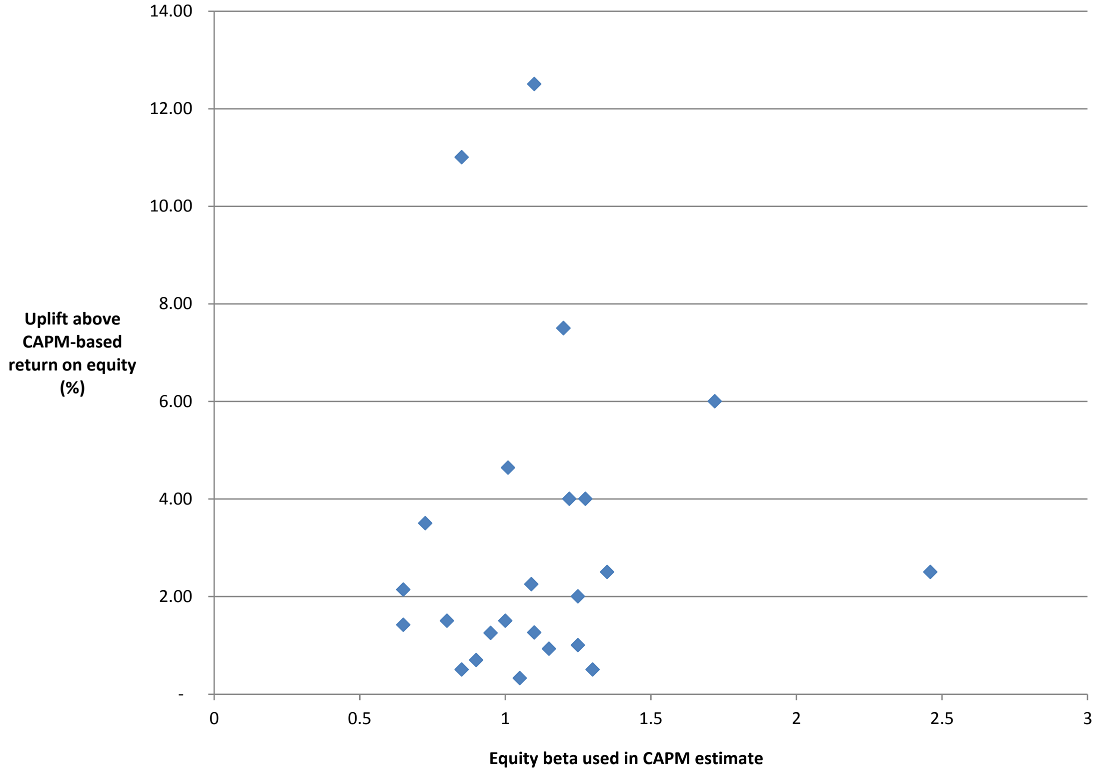
[1730] Incenta Economic Consulting, Further update on the required return on equity from independent expert reports, Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, AusGrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, p. 31.

[1731] 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, Essential Energy, Powercor, SA Power Networks, and United Energy, February 2015, p. 18.

[1732] Grant Thornton for Polymetals Mining on 31/5/2013, Grant Thornton for Australian Power & Gas Company on 13/8/2013, RSM Bird Cameron for Ascot Resources on 17/9/2013, Grant Samuel for Clough Ltd on 11/10/2013, BDO for Australian Wealth Investments on 14/10/2013, Deloitte for RHG Ltd on 5/11/2013, Leadenhall for Spencer Resources on 13/11/2013, RSM Bird Cameron for Xceed Resources on 14/11/2013, Deloitte for Greencross Ltd on 11/12/2013, Leadenhall for FRR Corporation on 17/12/2013, Grant Samuel for CFS Retail Property Trust Group on 7/2/2014, Grant Samuel for Envestra Ltd on 4/3/2014, PKF Lawler for Savcor Group on 26/3/2014, Value Advisor Associates for TriAusMin Ltd on 9/4/2014, Grant Samuel for Westfield Group on 11/4/2014, Deloitte for Nexus Energy on 5/5/2014, Grant Samuel for David Jones Ltd on 22/5/2014, Grant Thornton for Mungana Goldmines on 23/5/2014, Grant Samuel for Aquila Resources on 20/6/2014, Titan Partners for Armidale Investment Corporation on 2/9/2014, William Buck for MDS Financial Group on 17/10/2014, KPMG for Arena REIT on 3/11/2014, KPMG for Empire Oil & Gas on 3/11/2014, Grant Thornton for Macquarie Radio Network on 19/2/2014.

[1733] This is despite 8 of the 24 reports mentioning the size premium from the Fama-French three-factor model as a reason for an uplift.

Figure 3-33 Correlation between valuer's uplift and equity beta



Source: AER analysis of data sourced from the Thomson Reuters Connect 4 database

F Return on equity material

Clauses 6.5.2(e) (distribution) and 6A.6.2(e) (transmission) of the National Electricity Rules and clause 87(5) of the National Gas Rules require us to have regard to relevant estimation methods, financial models, market data and other evidence. We had regard to all of the material submitted to us, however, all are not of equal value and therefore not equally relevant. Table 3-57 lists the information (and classes of information) we had regard to in estimating the expected return on equity including the information that we did not rely on.

Table 3-57 Information and their role in estimating the return on equity

Material (step one)	Role (step 2)
Equity models	
Standard (forward looking) Sharpe-Lintner CAPM	Foundation model
Wright CAPM specification	(a) No role in directly estimating the RoE for regulated infrastructure businesses (b) Limited directional role in to inform movements in overall return on equity
Historical input based CAPM specification	No role
Black CAPM	(a) No role in estimating equity beta or directly estimating the RoE for regulated infrastructure businesses; (b) Limited role informing the equity beta point estimate
Fama French Model	No Role
Dividend Growth Model	(a) No role in estimating equity beta or directly estimating the RoE for regulated infrastructure businesses (b) Limited role informing the MRP point estimate
Risk free rate	
Yields on 10 year Commonwealth government securities	Used as the proxy for the risk free rate.
MRP	
Historical excess returns	Given the most reliance in informing the MRP
Dividend growth models (AER's construction)	Given the second most reliance in informing the MRP
Survey evidence	Given some reliance in informing the MRP (point in time estimate)
Conditioning variables (dividend yields, credit spreads, implied volatility)	Given some reliance in informing the MRP (directional information only)
Other Australian regulators' MRP estimates	Cross check on how we consider information for informing the MRP
Dividend growth models (SFG's construction)	Does not inform our MRP estimate
Imputation credit adjustment (AER, Brailsford et al)	Adjust the MRP estimate under the DGM and historical excess returns

Material (step one)	Role (step 2)
Imputation credit adjustment (SFG, Officer)	Does not inform our MRP estimate
Equity beta	
Conceptual analysis	Cross check of Australian empirical estimates
Australian empirical estimates	Primary determinant of equity beta range, with significant weight in determining the point estimate
International empirical estimates	Inform equity beta point estimate
Evidence from the Black CAPM ((a) empirical evidence; (b) theoretical principles)	(a) No role in estimating equity beta; (b) Inform equity beta point estimate
Empirical evidence from dividend growth models (SFG's construction)	No role in estimating equity beta
Empirical evidence from the Fama–French three factor model	No role in estimating equity beta
Other information	
Wright approach	Directional role to inform movements in overall return on equity
Return on debt relative to the return on equity	Directional role to inform movements in overall return on equity
Return on equity estimates from valuation reports, broker reports, and other regulators' decisions	Directional role to inform movements in overall return on equity
Realised returns from asset sales and financial statements	No role

Material received and reviewed since November 2014

In determining our return on equity estimate for the benchmark efficient entity we have reviewed the material submitted by service providers and other stakeholders'.[1734] This material was submitted in the current regulatory determinations.[1735]

Expert reports submitted by service providers

The following is a list of reports commissioned by the service providers:

- SFG Consulting:

[1734] Whilst this attachment includes a comprehensive list of the material reviewed by us, there could be material that may have been inadvertently omitted. The AER website also lists all of the material according to the stage at which these were provided, by whom and in which determination process

[1735] Current regulatory determinations are for the following eleven NSPs: final decisions for ActewAGL, Ausgrid, DirectLink (accepted our draft decision on return on equity), Endeavour Energy, Essential Energy, Jemena Gas Networks, TasNetworks (accepted our draft decision on return on equity), TransGrid; and draft decisions for Ergon Energy, Energex and SA Power Networks.

- *The required return on equity: Initial review of AER draft decisions: Note for ActewAGL, Ausgrid, Essential Energy and Endeavour Energy*, 19 January 2015;
- *The required return on equity for the benchmark efficient entity, Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, APA, Ausgrid, Ausnet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, 13 February 2015
- *The required return on equity for the benchmark efficient entity, A report for Ausgrid, Endeavour Energy and Essential Energy,* 12 March 2015
- *Using the Fama-French model to estimate the required return on equity, Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, Ausnet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, 13 February 2015
- *Beta and the Black Capital Asset Pricing Model, Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, Ausnet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, 13 February 2015
- *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network, Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL Electricity, APA, Ausgrid, Ausnet Services, CitiPower, Endeavour, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, 13 February 2015
- *Estimating the required return on equity, Report for Energex*, 28 August 2014
- *Updated estimate of the required return on equity, Draft report for Ergon,* 14 August
- *Updated estimate of the required return on equity, Report for SAPN,* 8 September 2014
- *The required return on equity: Initial review of AER draft decisions, Report for Energex,* 30 January 2015

- NERA Economic Consulting:
  - *Historical estimates of the market risk premium, A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, February 2015
  - *Empirical Performance of Sharpe-Lintner and Black CAPMs, A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, AusNet*

Services, CitiPower, Energex, Powercor, SA Power Networks, and United Energy, February 2015

    - *Memo: Revised estimates of the Market Risk Premium*, 14 November 2014

- Houston Kemp, *Economic review of ERA's Draft Decision, A report for Johnson Winter and Slatery*, 27 November 2014
- Incenta, *Further update on the required return on equity from Independent expert reports,* February 2015
- Grant Samuel, *Response to AER draft decisions*, January 2015
- CEG, *Estimating the cost of equity, equity beta and MRP*, January 2015
- Prof Bruce Grundy, *Letter from Bruce Grundy to Justin De Lorenzo – 9 January 2015*, January 2015
- David Newberry, *CEPA: Expert report*, January 2015
- Herbert Smith Freehills, *AER draft decision – return on equity*, 13 March 2015

The following reports were also submitted:

- Economic Science Prize Committee of the Royal Swedish Academy of Sciences, *Scientific background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2013*,
- Matt Rogers, *Energy = Innovation: ten disruptive technologies, McKinsey on Sustainability & Resource Productivity*
- Ryan Kerin, *A dimmer light: the changing regulatory environment causes revenue to decline*
- IBISWorld, *Industry Report D2630 Electricity Distribution in Australia*, December 2014
- Citi Group, *Energy Darwinism, The evolution of the energy industry*, October 2013
- Rocky Mountain Institute, *The Economics of Grid Defection, When and where distributed solar generation plus storage competes with traditional utility service*
- UBS, *Global Utilities, Autos & Chemicals: Will solar, batteries and electric cars re-shape the electricity system*?

Submissions from the Consumer Challenge Panel

The Consumer Challenge Panel provided the following submissions:

- CCP Sub-Panel–Bruce Mountain, Energex, Ergon and SAPN revenue controls, January 2105
- CCP Sub-Panel–Hugh Grant, AER draft TransGrid determination and TransGrid's revised revenue proposal, 6 February 2105
- CCP Sub-Panel, Response to AER draft TransGrid determination TransGrid's revised revenue proposal, February 2105

- CCP Sub-Panel, Response to AER draft TasNetworks determination and TasNetworks revised revenue proposal, February 2105

Submissions from stakeholders

The following stakeholders commented on Energex's return on equity proposal:

- AGL, *Submission on Energex's regulatory proposal 2015-20*, 30 January 2015, p. 16.
- Australian PV Institute, *Submission on Energex's regulatory proposal 2015-20*, 30 January 2015, p. 6.
- Canegrowers, *Submission on Qld distributors' regulatory proposals 2015-20*, 30 January 2015, pp. 5–6.
- Canegrowers Isis, *Submission on Qld distributors' regulatory proposals 2015-20*, 30 January 2015, p. 2.
- Central Highland Cotton Growers and Irrigators Association, *Submission on Qld distributors' regulatory proposals 2015-20*, 30 January 2015, pp. 2–3.
- COTA, *Submission on Energex's regulatory proposal 2015-20*, 30 January 2015, pp. 1–2.
- Chamber of Commerce and Industry Queensland, *Submission on Energex's regulatory proposal 2015-20*, 30 January 2015, pp. 14–17.
- Cotton Australia, *Submission on Qld distributors' regulatory proposals 2015-20*, 30 January 2015, pp. 10–11.
- Darling Downs Cotton Growers, *Submission on Qld distributors' regulatory proposals 2015-20*, 30 January 2015, pp. 1–2.
- Electrical Trades Union, *Submission on Qld distributors' regulatory proposals 2015-20*, 30 January 2015, pp. 6–9.
- Origin Energy, *Submission on Qld distributors' regulatory proposals 2015-20*, 30 January 2015, pp. 16–17.
- Queensland Council of Social Service, *Submission on Qld distributors' regulatory proposals 2015-20*, 30 January 2015, pp. 70–81.
- Queensland Farmers' Federation, *Submission on Qld distributors' regulatory proposals 2015-20*, February 2015, pp. 10–11.
- Total Environment Centre, *Submission on Qld distributors' regulatory proposals 2015-20*, 30 January 2015, pp.18–20.

The following service provider commented on Energex's regulatory proposal:

- Energex, *Submission on Energex's regulatory proposal 2015-20 and AER issues paper*, 30 January 2015, pp.22–24.
- Energex, *Submission on Energex's regulatory proposal 2015-20 and AER issues paper – Attachment 2: Gamma*, 30 January 2015, pp. 12–15.

- Energex, *Response to issues paper – Supplementary response*, 18 February 2015, pp. 1–39.

G Return on debt approach

In attachment 3 we set out our position on the return on debt and key reasons for that position. We also summarised Energex's proposed position on the return on debt and responded to the key issues raised in Energex's proposal.

In this appendix, we set out further supporting material for our position on the return on debt. We also respond to Energex's proposed return on debt and key issues raised by other stakeholders in more detail. Specifically, this appendix details further analysis on the choice of a simple or weighted average.

G.1 Simple or weighted average

In section 3.4.2 of attachment 3, we set out our preliminary decision to calculate the allowed return on debt as a simple average, rather than the PTRM-weighted average proposed by Energex and Ergon Energy. In this section, we set out in detail:

- the requirements of the rules relating to determining the allowed return on debt
- the PTRM-weighted average approach proposed by Energex and Ergon Energy
- our assessment of whether the PTRM-weighted average will better reflect the return on debt of the benchmark efficient entity
- our assessment of whether the PTRM-weighted average will promote better capex incentives
- our assessment of the materiality of the choice between the simple average and the PTRM-weighted average, and
- our responses to the key issues raised by stakeholders.

G.1.1 The requirements of the rules

We must estimate a service provider's return on debt for a regulatory year (that is, the 'allowed return on debt') such that it contributes to the achievement of the allowed rate of return objective.[1736] The allowed rate of return objective is that the allowed 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 services.[1737] In addition to contributing to the achievement of the allowed rate of return objective, we must have regard to the following factors:[1738]

1736 NER, cl. 6.5.2(h).
1737 NER, cl. 6.5.2(c).
1738 NER, cl. 6.5.2(k)(1)–(4).

2. 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.
3. The interrelationship between the return on equity and the return on debt.
4. The incentives that the return on debt may provide in relation to capex over the regulatory period, including as to the timing of any capex.
5. 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.

Given the allowed rate of return objective and the first factor, we consider that one approach to determining the allowed return on debt will generally meet the requirements of the rules better than another approach if it produces an allowed return on debt that more closely reflects the return on debt of the benchmark efficient entity. The return on debt of the benchmark efficient entity itself will reflect the sizes of the individual tranches of debt entered into by the benchmark efficient entity, and the rates of return on those tranches of debt. Because the benchmark efficient entity does not exist, its return on debt is hypothetical and not observable. Therefore, assessing whether one approach to determining the allowed return on debt reflects the return on debt of the benchmark efficient entity better than another approach is difficult and must be done mainly with regard to conceptual considerations.

G.1.2 Energex and Ergon Energy's proposal

Energex and Ergon Energy proposed that, in calculating the allowed return on debt, the trailing average be weighted by the 'debt component of the forecast capex approved in the PTRM'. This approach effectively weights the prevailing rates in each of the past 10 years by the amount of debt that the service provider was forecasted in its PTRM to have raised in that year.

Under the Guideline, we provide for the benchmark efficient entity to fund 60 per cent of its RAB through debt and 40 per cent through equity (that is, we employ a fixed gearing ratio of 60:40). It follows that we consider that the benchmark efficient entity maintains a portfolio of debt, the size of which at any point in time is equal to 60 per cent of the size of its RAB at that point in time. Forecast capex is the primary driver of the profile of a service provider's RAB in the PTRM; for example, in general the service provider's RAB will be forecast to grow in the PTRM when forecast capex is greater than depreciation. Accordingly, where the capex forecast of a service provider leads to an increase in its RAB in the PTRM, the service provider's debt portfolio in the PTRM will also increase. In reality, if a service provider is increasing its debt portfolio, then it is raising new debt in addition to refinancing the maturing portion of its existing debt portfolio.

Energex and Ergon Energy submitted that the PTRM-weighted average approach to calculating the allowed return on debt reflects the potential 'lumpy' nature of capex and the associated debt raising. For example, if a business raises $50 of debt at an interest rate of 6 per cent and $50 at 7 per cent, the return on debt of the business's $100 debt portfolio is 6.5 per cent ($= \frac{\$50}{\$100} \times 0.06 + \frac{\$50}{\$100} \times 0.07$). However, if the business raised debt in a lumpier fashion, such that different amounts of debt were raised at different rates, then this would be reflected in its overall return on debt; for instance, if $25 of debt is raised at 6 per cent and $75 of debt is raised at 7 per cent, the return on debt of such a portfolio becomes 6.75 per cent ($= \frac{\$25}{\$100} \times 0.06 + \frac{\$75}{\$100} \times 0.07$).

Table 3-58 demonstrates the operation of the PTRM-weighted average versus the simple average over the upcoming regulatory period. This table presents a snapshot of a spreadsheet provided by Ergon Energy.[1739] All data in the table was provided by Ergon Energy in its spreadsheet. For ease of understanding, components of the table are presented and explained separately in the discussion following the table.

[1739] Ergon Energy spreadsheet, '08.01.12 Weighted trailing average return on debt model'.

Table 3-58 Operation of PTRM-weighted average versus simple average

Row		01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
1	Opening PTRM RAB	$10,041.50	$10,651.70	$11,233.30	$11,748.10	$12,311.50
2	Closing PTRM RAB	$10,651.70	$11,233.30	$11,748.10	$12,311.50	$12,867.00
3	Benchmark gearing	60%	60%	60%	60%	60%
4	Opening debt portfolio	$6,024.9	$6,391.0	$6,740.0	$7,048.9	$7,386.9
5	Closing debt portfolio	$6,391.0	$6,740.0	$7,048.9	$7,386.9	$7,720.2
6	Change in debt portfolio	$366.1	$349.0	$308.9	$338.0	$333.3
7	Weighting to new debt		5.7%	5.2%	4.4%	4.6%
8	Weighting to old debt		94.3%	94.8%	95.6%	95.4%
9	Prevailing rate	6.36%	7.00%	7.75%	8.00%	8.25%

Row		Adjusted prevailing rates				
	Observation	01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
10	t = -9	6.36%	6.40%	6.47%	6.53%	6.61%
11	t = -8	6.36%	6.40%	6.47%	6.53%	6.61%
12	t = -7	6.36%	6.40%	6.47%	6.53%	6.61%
13	t = -6	6.36%	6.40%	6.47%	6.53%	6.61%
14	t = -5	6.36%	6.40%	6.47%	6.53%	6.61%
15	t = -4	6.36%	6.40%	6.47%	6.53%	6.61%
16	t = -3	6.36%	6.40%	6.47%	6.53%	7.13%
17	t = -2	6.36%	6.40%	6.47%	7.08%	7.78%
18	t = -1	6.36%	6.40%	7.04%	7.76%	8.01%
19	t = 0 (ie, prevailing rate)	6.36%	7.00%	7.75%	8.00%	8.25%
20	***Allowed return on debt - PTRM-weighted average***	***6.36%***	***6.46%***	***6.65%***	***6.86%***	***7.09%***

Row		Prevailing rates				
	Observation	01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
21	t = -9	6.36%	6.36%	6.36%	6.36%	6.36%
22	t = -8	6.36%	6.36%	6.36%	6.36%	6.36%
23	t = -7	6.36%	6.36%	6.36%	6.36%	6.36%
24	t = -6	6.36%	6.36%	6.36%	6.36%	6.36%
25	t = -5	6.36%	6.36%	6.36%	6.36%	6.36%
26	t = -4	6.36%	6.36%	6.36%	6.36%	6.36%
27	t = -3	6.36%	6.36%	6.36%	6.36%	7.00%
28	t = -2	6.36%	6.36%	6.36%	7.00%	7.75%
29	t = -1	6.36%	6.36%	7.00%	7.75%	8.00%
30	t = 0 (ie, prevailing rate)	6.36%	7.00%	7.75%	8.00%	8.25%
31	***Allowed return on debt - simple average***	***6.36%***	***6.42%***	***6.56%***	***6.73%***	***6.92%***

Rows 1 and 2 show the forecast path of the RAB, which is driven primarily by forecast capex (not shown). Rows 4 and 5 show the size of the debt portfolio corresponding to the RAB, given the benchmark gearing ratio of 60 per cent in row 3. The change in debt portfolio (row 6) is equal to the closing debt portfolio (row 5) minus the opening debt portfolio (row 4).

Row 9 shows the prevailing market rate of return on debt at the start of each regulatory year. This is the market rate that was observed just prior to the relevant regulatory year; for example, the prevailing rate for 2015–2016 (6.36 per cent) would actually have been observed during 2014–2015.

Row		01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
1	Opening PTRM RAB	$10,041.50	$10,651.70	$11,233.30	$11,748.10	$12,311.50
2	Closing PTRM RAB	$10,651.70	$11,233.30	$11,748.10	$12,311.50	$12,867.00
3	Benchmark gearing	60%	60%	60%	60%	60%
4	Opening debt portfolio	$6,024.9	$6,391.0	$6,740.0	$7,048.9	$7,386.9
5	Closing debt portfolio	$6,391.0	$6,740.0	$7,048.9	$7,386.9	$7,720.2
6	Change in debt portfolio	$366.1	$349.0	$308.9	$338.0	$333.3
7	Weighting to new debt		5.7%	5.2%	4.4%	4.6%
8	Weighting to old debt		94.3%	94.8%	95.6%	95.4%
9	Prevailing rate	6.36%	7.00%	7.75%	8.00%	8.25%

Row 31 shows the allowed return on debt as calculated by the simple average. It is equal to the average of the 10 rates shown in rows 21 to 30. These rates are the 10 past prevailing rates. Note that in this example, the prevailing rate is assumed to be 6.36 per cent for each of the nine years prior to 2015–2016.

		Prevailing rates				
	Observation	01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
21	t = -9	6.36%	6.36%	6.36%	6.36%	6.36%
22	t = -8	6.36%	6.36%	6.36%	6.36%	6.36%
23	t = -7	6.36%	6.36%	6.36%	6.36%	6.36%
24	t = -6	6.36%	6.36%	6.36%	6.36%	6.36%
25	t = -5	6.36%	6.36%	6.36%	6.36%	6.36%
26	t = -4	6.36%	6.36%	6.36%	6.36%	6.36%
27	t = -3	6.36%	6.36%	6.36%	6.36%	7.00%
28	t = -2	6.36%	6.36%	6.36%	7.00%	7.75%
29	t = -1	6.36%	6.36%	7.00%	7.75%	8.00%
30	t = 0 (ie, prevailing rate)	6.36%	7.00%	7.75%	8.00%	8.25%
31	***Allowed return on debt - simple average***	***6.36%***	***6.42%***	***6.56%***	***6.73%***	***6.92%***

Row 20 shows the allowed return on debt as calculated by the PTRM-weighted average. It is equal to the average of the 10 rates in rows 10 to 19. The rate in row 19 is the prevailing rate for that year. The nine rates in rows 10 to 18 are adjusted prevailing rates. They have been adjusted such that the average of these nine rates and the prevailing rate effectively gives relatively greater weight to the prevailing rates observed in years in which the service provider was forecasted in its PTRM to have raised relatively more debt.

		Adjusted prevailing rates				
	Observation	01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
10	t = -9	6.36%	6.40%	6.47%	6.53%	6.61%
11	t = -8	6.36%	6.40%	6.47%	6.53%	6.61%
12	t = -7	6.36%	6.40%	6.47%	6.53%	6.61%
13	t = -6	6.36%	6.40%	6.47%	6.53%	6.61%
14	t = -5	6.36%	6.40%	6.47%	6.53%	6.61%
15	t = -4	6.36%	6.40%	6.47%	6.53%	6.61%
16	t = -3	6.36%	6.40%	6.47%	6.53%	7.13%
17	t = -2	6.36%	6.40%	6.47%	7.08%	7.78%
18	t = -1	6.36%	6.40%	7.04%	7.76%	8.01%
19	t = 0 (ie, prevailing rate)	6.36%	7.00%	7.75%	8.00%	8.25%
20	***Allowed return on debt - PTRM-weighted average***	***6.36%***	***6.46%***	***6.65%***	***6.86%***	***7.09%***

To make the adjustment, the weighting to new debt (row 7) must be calculated. It is equal to the percentage increase in debt portfolio from the previous year. For example, the weighting to new debt for 2016–2017 of 5.7 per cent (highlighted in green) is equal to the change in debt portfolio in 2015–2016 ($366.1) as a percentage of the closing debt portfolio in 2015–2016 ($6,391.0) (both highlighted in yellow). The weighting to old debt (row 8) is equal to one minus the weighting to new debt.

Row		01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
1	Opening PTRM RAB	$10,041.50	$10,651.70	$11,233.30	$11,748.10	$12,311.50
2	Closing PTRM RAB	$10,651.70	$11,233.30	$11,748.10	$12,311.50	$12,867.00
3	Benchmark gearing	60%	60%	60%	60%	60%
4	Opening debt portfolio	$6,024.9	$6,391.0	$6,740.0	$7,048.9	$7,386.9
5	Closing debt portfolio	$6,391.0	$6,740.0	$7,048.9	$7,386.9	$7,720.2
6	Change in debt portfolio	$366.1	$349.0	$308.9	$338.0	$333.3
7	Weighting to new debt		5.7%	5.2%	4.4%	4.6%
8	Weighting to old debt		94.3%	94.8%	95.6%	95.4%
9	Prevailing rate	6.36%	7.00%	7.75%	8.00%	8.25%

The adjusted prevailing rates are then calculated as follows. The adjusted rate in row 'n' for a given year is equal to:

- the rate in row 'n+1' from the previous year multiplied by the weighting to old debt for the current year, plus
- the rate in row 19 for the current year multiplied by the weighting to new debt for the current year.

For example, the rate in row 18 for 2016–2017 is 6.40 per cent (highlighted in green). It has been calculated as:

- 6.36 per cent multiplied by 94.3 per cent, plus
- 7.00 per cent multiplied by 5.7 per cent (all highlighted in yellow).

Row		01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
1	Opening PTRM RAB	$10,041.50	$10,651.70	$11,233.30	$11,748.10	$12,311.50
2	Closing PTRM RAB	$10,651.70	$11,233.30	$11,748.10	$12,311.50	$12,867.00
3	Benchmark gearing	60%	60%	60%	60%	60%
4	Opening debt portfolio	$6,024.9	$6,391.0	$6,740.0	$7,048.9	$7,386.9
5	Closing debt portfolio	$6,391.0	$6,740.0	$7,048.9	$7,386.9	$7,720.2
6	Change in debt portfolio	$366.1	$349.0	$308.9	$338.0	$333.3
7	Weighting to new debt		5.7%	5.2%	4.4%	4.6%
8	Weighting to old debt		94.3%	94.8%	95.6%	95.4%
9	Prevailing rate	6.36%	7.00%	7.75%	8.00%	8.25%

		Adjusted prevailing rates				
	Observation	01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
10	t = -9	6.36%	6.40%	6.47%	6.53%	6.61%
11	t = -8	6.36%	6.40%	6.47%	6.53%	6.61%
12	t = -7	6.36%	6.40%	6.47%	6.53%	6.61%
13	t = -6	6.36%	6.40%	6.47%	6.53%	6.61%
14	t = -5	6.36%	6.40%	6.47%	6.53%	6.61%
15	t = -4	6.36%	6.40%	6.47%	6.53%	6.61%
16	t = -3	6.36%	6.40%	6.47%	6.53%	7.13%
17	t = -2	6.36%	6.40%	6.47%	7.08%	7.78%
18	t = -1	6.36%	6.40%	7.04%	7.76%	8.01%
19	t = 0 (ie, prevailing rate)	6.36%	7.00%	7.75%	8.00%	8.25%
20	***Allowed return on debt - PTRM-weighted average***	***6.36%***	***6.46%***	***6.65%***	***6.86%***	***7.09%***

These adjusted rates then carry over into the calculation for the next year. For example, the rate in row 17 for 2017–2018 is 6.47 per cent (highlighted in green). It has been calculated as:

- 6.40 per cent multiplied by 94.8 per cent, plus
- 7.75 per cent multiplied by 5.2 per cent (all highlighted in yellow).

Thus, the prevailing rate for 2015–2016 (6.36 per cent) is reflected in the calculation of the allowed return on debt for 2017–2018, but it has undergone two iterations of adjustments (see red arrows).

Row		01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
1	Opening PTRM RAB	$10,041.50	$10,651.70	$11,233.30	$11,748.10	$12,311.50
2	Closing PTRM RAB	$10,651.70	$11,233.30	$11,748.10	$12,311.50	$12,867.00
3	Benchmark gearing	60%	60%	60%	60%	60%
4	Opening debt portfolio	$6,024.9	$6,391.0	$6,740.0	$7,048.9	$7,386.9
5	Closing debt portfolio	$6,391.0	$6,740.0	$7,048.9	$7,386.9	$7,720.2
6	Change in debt portfolio	$366.1	$349.0	$308.9	$338.0	$333.3
7	Weighting to new debt		5.7%	5.2%	4.4%	4.6%
8	Weighting to old debt		94.3%	94.8%	95.6%	95.4%
9	Prevailing rate	6.36%	7.00%	7.75%	8.00%	8.25%

Row	Observation	Adjusted prevailing rates 01 Jul 15	01 Jul 16	01 Jul 17	01 Jul 18	01 Jul 19
10	t = -9	6.36%	6.40%	6.47%	6.53%	6.61%
11	t = -8	6.36%	6.40%	6.47%	6.53%	6.61%
12	t = -7	6.36%	6.40%	6.47%	6.53%	6.61%
13	t = -6	6.36%	6.40%	6.47%	6.53%	6.61%
14	t = -5	6.36%	6.40%	6.47%	6.53%	6.61%
15	t = -4	6.36%	6.40%	6.47%	6.53%	6.61%
16	t = -3	6.36%	6.40%	6.47%	6.53%	7.13%
17	t = -2	6.36%	6.40%	6.47%	7.08%	7.78%
18	t = -1	6.36%	6.40%	7.04%	7.76%	8.01%
19	t = 0 (ie, prevailing rate)	6.36%	7.00%	7.75%	8.00%	8.25%
20	***Allowed return on debt - PTRM-weighted average***	***6.36%***	***6.46%***	***6.65%***	***6.86%***	***7.09%***

In the example presented in Table 3-58, both prevailing rates and the service provider's RAB are forecast to increase over the course of the regulatory period. This means that the service provider is forecast to raise increased amounts of debt at rates higher than the average rate over the past 10 years. The PTRM-weighted average is able to more 'quickly' reflect in the allowed return on debt this forecast increase in debt raising at higher rates. That is, for a growing RAB in an environment of increasing rates, the simple average will be lower than the PTRM-weighted average. The opposite will be true for a growing RAB in an environment of decreasing rates; that is, the simple average will be higher than the PTRM-weighted average because the service provider is expected to be raising increased amounts of debt at rates lower than the average rate over the past 10 years. If rates move up and down over time, we expect the PTRM-weighted average and the simple average to produce broadly the same allowed return on debt on average over time. For example, using the full 15 years of data provided by Ergon Energy, Figure 3-34 shows that there is just a 0.05 percentage point difference in the average allowed return on debt between using the PTRM-weighted average versus the simple average over the upcoming three regulatory periods.

Figure 3-34 Average allowed return on debt—Ergon Energy example

Source: Ergon Energy spreadsheet, '08.01.12 Weighted trailing average return on debt model'; AER calculations.

Energex and Ergon Energy submitted that the PTRM-weighted average will reflect the return on debt of the benchmark efficient entity better than the simple average because it has the capacity to reflect lumpiness in debt raising. Energex and Ergon Energy also submitted that the PTRM-weighted average will promote better capex incentives. On balance, Energex and Ergon Energy's proposals have not satisfied us on either of these points, and we set out our reasons below.

G.1.3 Reflecting the return on debt of the benchmark efficient entity

We consider that the PTRM-weighted average might reflect the return on debt of the benchmark efficient entity better than the simple average in some circumstances, but we are not satisfied that it will always do so.

We expect that both the simple average and PTRM-weighted average will produce an allowed return on debt that reflects the return on debt of the benchmark efficient entity *over time*. This is because we expect that the return on debt of the benchmark efficient entity will reflect debt entered into in each of the past 10 years; that is, we consider that the benchmark efficient entity would seek to stagger its debt raising, such that only a portion (around 10 per cent) of its debt portfolio matured each year.

We consider that the PTRM-weighted average will produce an allowed return on debt that better reflects the return on debt of the benchmark efficient entity than that produced by the simple average *both over time and at points in time* if:

(a) the amount of debt that the service provider was forecasted in its PTRM to have raised each year

reflects

(b) the amount of debt that would have been raised each year by the benchmark efficient entity.

Ergon Energy and Energex submitted that (a) will reflect (b) because capex forecasts are approved by us with regard to efficiency considerations. We agree that a service provider's approved capex forecast likely reflects the capex that a benchmark efficient entity at the beginning of a regulatory period would plan to make. However, we consider that a benchmark efficient entity could react to new information over time so that its actual capex departed from its planned capex. Such new information could include changed conditions in the market for debt funding, changes in demand or other technical considerations. Accordingly, we are not satisfied that (a) will necessarily reflect (b) in all circumstances.

Energex addressed this idea in its proposal:[1740]

> Energex agrees that future investment requirements may change as information becomes available regarding the underlying driver of the expenditure (particularly for augmentation projects). However, as a provider of an essential service, it may not be feasible, or appropriate, for it to postpone or defer expenditure because of prevailing conditions in capital markets (which could persist for some time). Indeed, in Energex's view, to do so would be inconsistent with the overarching objective of the National Electricity Law (clause 7).

We do not agree that such postponement or deferral would necessarily be inconsistent with the NEO. By contrast, we consider that funding capex at any cost might not promote the efficient use of electricity services for the long-term interests of consumers. Therefore, deferring planned capex when the opportunity cost of capital is high might be consistent with the NEO.

Further, if the benchmark efficient entity did seek to defer large capex programs in adverse market conditions, this would undermine the ability of the PTRM-weighted average to reflect the return on debt of the benchmark efficient entity. This is because the PTRM-weighted average would potentially assign large weights to high prevailing market rates when the benchmark efficient entity might have specifically sought to avoid or minimise borrowing at those rates.

G.1.4 Capex incentives

We consider that the PTRM-weighted average might promote better capex incentives, but we do not consider that Energex and Ergon Energy's proposals put forward a clear

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[1740] Energex, *Regulatory proposal 2015–2020*, October 2014, p. 169.

case to this effect. Therefore, we are not satisfied that the PTRM-weighted average will necessarily promote better capex incentives.

Energex and Ergon Energy's proposals appear to suggest that the PTRM-weighted average's ability to more 'quickly' reflect changes in prevailing rates (see discussion of Figure 3-34 above) will promote better capex planning incentives. For example, Ergon Energy submitted:

> Achieving a better alignment between the return on debt that would apply to new capital expenditure and prevailing market rates provides a clearer investment signal. A significant mismatch between the regulated return on debt and the costs that a NSP would face in undertaking new borrowings is more likely to distort investment decisions.

We acknowledged in the Guideline this potential for investment distortions.[1741] However, Energex and Ergon Energy's proposals also suggest that factors other than the form of the allowed return on debt are the primary drivers of capex planning. For instance, Energex submitted:[1742]

> The capex profiles of electricity NSPs are inherently lumpy in nature, depending on the timing of necessary replacement expenditure as well as (more demand driven) network augmentations. The primary driver of the amount and timing of this expenditure will be matters such as an asset approaching the end of its life, the premature failure of an asset, risks to reliability/service quality and customer driven requirements. The efficient benchmark entity will invest in replacement and augmentation assets in accordance with its network requirements.

And Ergon Energy submitted:[1743]

> The key issue is whether or not the decision to invest is consistent with efficient practice, which is considered by the AER in approving the projected capital expenditure program. The onus is on the NSP to show that its capital expenditure program is efficient given factors such as the age and condition of its network assets and expected future demand growth.

Therefore, if factors other than the form of the allowed return on debt are the primary drivers of capex planning, it is not clear how the PTRM-weighted average will necessarily provide better capex planning incentives relative to the simple average.

It is also not clear to us that the PTRM-weighted average would provide better incentives to either adhere to or depart from capex forecasts. On this point, Energex submitted:[1744]

[1741] AER, Explanatory statement—Rate of return guideline, December 2013, p. 115.

[1742] Energex, *Regulatory proposal 2015–2020*, October 2014, p. 168.

[1743] Ergon Energy, *Regulatory proposal 2015– 2020*, October 2014, p. 142.

[1744] Energex, *Regulatory proposal 2015–2020*, October 2014, p. 171.

> [The PTRM-weighted average] reduces the likelihood that the timing of efficient investment is deliberately deferred because of an interest rate view (compared to the simple average approach), which apart from having the potential to prove to be incorrect, could be in conflict with the objective of the NEL.

We understand Energex's remarks to mean that, under the PTRM-weighted average, a service provider will be less likely to defer investment when they assess the prevailing rate to be ‘high’. However, as discussed above, the deferral of capex when the opportunity cost of capital is high might be consistent with the NEO.[1745]

G.1.5 Materiality

In the two sections above, we acknowledge that the PTRM-weighted average might better meet key aspects of the rules, but note that the evidence before us does not satisfy us to this effect. In deciding whether we should depart from the Guideline approach in favour of the PTRM-weighted average, we have also considered the potential materiality of this decision for the service provider’s allowed revenue.

We have undertaken analysis using data provided by Ergon Energy which suggests that the difference in allowed revenue in the upcoming regulatory period between using the PTRM-weighted average versus the simple average might be immaterial. We consider that this provides further support for our preliminary decision of maintaining the Guideline approach rather than adopting the increased complexity of using the PTRM-weighted average. We also note that Energex and Ergon Energy provided no quantitative analysis of the materiality of this issue in their proposals.

We have assessed materiality using the same spreadsheet which underlies Table 3-58.[1746] Using the data as provided by Ergon Energy, we have calculated indicative estimates of the revenue associated with the allowed return on debt by multiplying the debt portfolio (that is, 60 per cent of the RAB) by the allowed return on debt under both the PTRM-weighted and simple average approaches. A summary of our analysis is presented in Table 3-59. It shows that the revenue difference for the upcoming regulatory period between using the PTRM-weighted average versus the simple average is equal to 0.38 per cent of Ergon Energy’s total proposed building block revenue. Consistent with the definition in the rules related to the materiality for pass-through applications, we would consider that this revenue impact of less than 1 per cent is immaterial.[1747]

[1745] The acceleration of capex programs when the opportunity cost of capital is low might also be consistent with the NEO.

[1746] Ergon Energy spreadsheet, '08.01.12 Weighted trailing average return on debt model'.

[1747] NER, cl. 6.6.1 and the definition of 'materially' in NER, chapter 10.

Table 3-59 Materiality of averaging approach—Ergon Energy example

	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Closing RAB ($m, nominal)	$10,652	$11,233	$11,748	$12,312	$12,867	
Benchmark gearing	60%	60%	60%	60%	60%	
Closing debt portfolio ($m, nominal)	$6,391	$6,740	$7,049	$7,387	$7,720	
Prevailing rate[a]	6.36%	7.00%	7.75%	8.00%	8.25%	
Allowed return on debt - PTRM-weighted average	6.36%	6.46%	6.65%	6.86%	7.09%	
Allowed return on debt - Simple average	6.36%	6.42%	6.56%	6.73%	6.92%	
Revenue from allowed return on debt - PTRM-weighted average ($m, nominal)	$406	$435	$469	$507	$547	$2,364
Revenue from allowed return on debt - Simple average ($m, nominal)	$406	$433	$463	$497	$534	$2,333
Absolute difference in allowed revenue ($m, nominal)	0	$2	$6	$10	$13	$31
Proposed total building block revenue	$1,511	$1,598	$1,704	$1,711	$1,718	$8,242
Absolute difference in allowed revenue as percentage of total	0.00%	0.14%	0.37%	0.57%	0.76%	0.38%

Source: Ergon Energy spreadsheet, '08.01.12 Weighted trailing average return on debt model'; AER calculations.

(a): The calculations in the spreadsheet assume that the prevailing rate was 6.36 per cent for each of the nine years prior to 2015-16.

We have also assessed the likely materiality for Energex by inputting Energex's proposed RAB profile for the upcoming regulatory period into the spreadsheet. We find a similarly immaterial revenue difference, of around 0.4 per cent of Energex's total proposed building block revenue.

G.1.6 Responses to the key issues raised by stakeholders

The only submission to Energex and Ergon Energy's proposals that discusses in detail the choice of averaging approach is from the Queensland Council of Social Service (QCOSS).[1748] It submitted that the simple average is most commensurate with setting a return on debt that equates with the efficient financing costs of a benchmark efficient entity. QCOSS did not support the PTRM-weighted average because:[1749]

- In practice it is unlikely that the distributors' actual spending profile will match its approved capex profile, or that it necessarily reflects the only choice of a benchmark efficient spending profile.
- It ignores that borrowing practices are driven by a range of considerations other than actual capital spending profiles.
- It might raise another way to 'game' the regulatory framework, although the exact form of such games may be difficult for the regulator to predict ex ante.

We agree with the first dot point, and we make the same point in this preliminary decision. We also agree that borrowing practices will be driven by considerations beyond just capex. However, we still consider that it is possible that a benchmark efficient entity might raise debt in a lumpy fashion. On the third dot point, we agree that linking a service provider's capex profile with its allowed return on debt creates scope for potential strategic behaviour. However, we are unsure of the likelihood or nature of such behaviour, and therefore we do not rely on this consideration in rejecting the PTRM-weighted average.

[1748] QCOSS received technical advice on this and other rate of return issues from Engineroom Consulting.

[1749] QCOSS, *Understanding the long term interests of electricity customers, Submission to the AER's Queensland electricity distribution determination 2015-2020*, 30 January 2015, pp. 118–119.

H Return on debt implementation

In attachment 3 we set out our position on the return on debt and key reasons for that position. We also summarised Energex's proposed position on the return on debt and responded to the key issues raised in Energex's proposal.

In this appendix, we set out further supporting material for our position on the return on debt. We also respond to Energex's proposed return on debt and key issues raised by other stakeholders in more detail. Specifically, this appendix details further analysis on the benchmark credit rating, use of third party data series and choice of third party data series.

H.1 Credit rating: Calculation of industry median

In section 3.4.2 of attachment 3, we set out our position and key reasons on the benchmark credit rating. In this section, we set out further supporting details behind our calculation of the median credit rating of a sample of firms that are comparable to the benchmark efficient entity (the industry median). We also respond to issues raised by service providers on the calculation of the industry median.

We are satisfied that the industry median, based on our comparator set, supports a benchmark credit rating of BBB+. Stakeholders took differing positions on the benchmark credit rating. Some service providers and their consultants proposed a BBB+ credit rating.[1750] Some consumer groups and consultants also appeared supportive of maintaining a BBB+ credit rating.[1751] Other service providers and their consultants proposed a BBB credit rating, including Energex, Ergon Energy and SAPN.[1752] Whereas, consumer representatives generally submitted a credit rating of

[1750] TransGrid, *Revenue proposal*, May 2014, p. 178; Directlink, *Revenue proposal*, May 2014, p. 36; TasNetworks, *Tasmanian transmission revenue proposal,* May 2014, p. 108; 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.

[1751] AGL, *SAPN regulatory proposal July 2015 to June 2010*, 30 January 2015, p. 14; APVI, *Submission to the AER on the issues paper on SAPN's regulatory proposal*, December 2014, p. 5; ECCSA, *AER SA electricity distribution revenue reset SAPN application: A response*, December 2014, pp. 74–75; Lally, *Implementation issues for the cost of debt*, November 2014, pp. 28–31; SACES, *Independent estimates of the WACC for SAPN: Report commissioned by the SACOSS*, January 2015, pp. 13–14; SACOSS, *Submission to AER on SAPN 2015–2020 regulatory proposal*, January 2015, p. 21.

[1752] Ausgrid, *Regulatory proposal*, May 2014, pp. 70–71; AusNet Services, *Draft decisions NSW/ACT electricity distribution determination 2015–19*, February 2015, pp. 11–16; 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; CitiPower/Powercor, *Submission in relation to the first round of regulatory determinations under the new rules*, February 2015;Endeavour Energy, *Regulatory proposal*, May 2014, pp. 104–105, Energex, *2015–20 regulatory proposal*, October 2014, p. 153; Ergon Energy, *Appendix C: Rate of return, Regulatory proposal*, October 2014, p. 123; Essential Energy, *Regulatory proposal*, May 2014, pp. 90–92; ActewAGL, *Regulatory proposal*, 2 June 2014 (resubmitted 10 July 2014), p. 255; JGN, *Access arrangement information*, 30 June 2014, p. 9; 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.

BBB+ would overcompensate network service providers.[1753] Some consumer groups advised the BBB+ benchmark would particularly over-compensate the government owned serve providers.[1754] We are not satisfied these submissions provide reason to depart from our BBB+ benchmark credit rating. For instance, QCOSS submitted that a lower medium credit rating grade of BBB+ was inconsistent with the benchmark efficient entity.[1755] However, we would expect our empirical analysis of benchmark credit ratings to reflect this, given what ratings agencies take into account.[1756] In this section we set out the comparator set we use to estimate the industry median. We also respond to the following issues raised by stakeholders:

- whether the current industry median is BBB+ or BBB (raised by service providers)
- the length of the period used to estimate the industry median (raised by service providers)
- exclusions to the comparator set used to estimate the industry median (raised by service providers)
- whether we should use a private credit rating benchmark for government owned service providers (raised by consumer representatives)
- whether credit ratings are a good indicator of the return on debt (raised by consumer representatives).

H.1.1 Comparator set

We draw our comparator set for estimating the benchmark credit rating from Standard and Poor's industry report cards, with the exclusion of a firm that is government owned.[1757] This is made up of the following businesses:

- APT Pipelines Ltd

[1753] ECC, *Submission concerning the TransGrid revised revenue proposal 2014–19*, 3 February 2015; EMRF, *AER review of NSW electricity transmission 2014*, July 2014, p. 28; EMRF, *AER review of NSW electricity distribution 2014*, July 2014, p. 33; EMRF, NSW electricity transmission revenue reset: AER draft decision and TransGrid revised proposal, January 2015, p. 21; Norske Skog Albury Mill, *NSW Electricity Transmission Revenue Reset: Response to TransGrid's Application*, p. 4; QCOSS, Understanding the long term interests of electricity customers: Submission to the AER's Queensland electricity distribution determination 2015-2020, 30 January 2015, pp. 75–76

[1754] Hugh Grant (CCP member), *CCP submission AER draft TransGrid determination, TransGrid revised revenue proposal*, 6 February 2015., pp. 12–13; ECC, *Submission concerning the NSW distribution networks revised revenue proposal 2014–19: Submission to the AER*, 11 February 2015, p. 2; EMRF, *NSW electricity transmission revenue reset: AER draft decision and TransGrid revised proposal*, January 2015, p. 23; MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 55; Tasmanian Small Business Council, *Submission to the AER: TasNetworks transmission revenue reset — Draft determination & revised proposal*, February 2015, p. 32.

[1755] QCOSS, Understanding the long term interests of electricity customers: Submission to the AER's Queensland electricity distribution determination 2015-2020, 30 January 2015, pp. 75–76.

[1756] Credit rating agencies consider qualities that QCOSS submitted contribute to the low risk of the benchmark efficient entity. Specifically, ratings agencies consider factors including but not limited to market risk, cash flow certainty, the regulatory approach and gearing.

[1757] That is, Ergon Energy Corp Ltd.

- ATCO Gas Australian LP
- DBNGP Trust
- DUET Group
- ElectraNet Pty Ltd
- Energy Partnership (Gas) Pty Ltd
- Australian Gas Networks — previously Envestra Ltd
- ETSA Utilities
- Powercor Australia LLC
- AusNet Services — previously SP AusNet Group
- SGSP Australia Assets Pty Ltd — previously SPI (Australia) Assets Pty Ltd
- The CitiPower Trust
- United Energy Distribution Pty Ltd.

We consider the median credit ratings over different time periods using our comparator set. Table 3-60 sets out these median credit ratings.

Table 3-60 Median credit rating for AER sample over different periods

Time period	Median credit rating	Time period	Median credit rating
2015 (to date)	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 (Standard and Poor's), AER analysis.

While Table 3-60 shows some support for a credit rating of BBB, we consider it shows stronger support for a credit rating of BBB+.

H.1.2 Current industry median

To support their proposals for a benchmark credit rating of BBB, service providers referred to material from Kanangra, JGN and/or CEG.[1758]

[1758] CEG, *Memorandum: Factors relevant to estimating a trailing average cost of debt*, May 2014, pp. 12–15; CEG, *WACC estimates*, May 2014, p. 64; JGN, *2015–20 Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, pp. 9–10; JGN, *2015–20 Access arrangement response: Appendix 7.10 Return on*

Ergon Energy and Energex referred to a report by Kanangra that the ENA submitted during the Guideline development process.[1759] The Kanangra report was initially submitted by the ENA in 2013.[1760] When we received this report, we replicated its full sample analysis using a median credit rating approach. We found this gave a median Standard and Poor's credit rating of BBB+ with a positive outlook from 2008 when the 2013 data available at the time was included. Excluding 2013 data resulted in a median credit rating of A-.[1761] We consider this provides more support for our benchmark credit rating of BBB+ than for a credit rating of BBB.

Ergon Energy also referred to the credit rating data submitted by JGN and CEG in 2014.[1762] It appears that these reports did not include all data up to the 2013 calendar year end, when several upgrades occurred.[1763] JGN later submitted a revised analysis with its revised proposal, which reconciles with our analysis in this preliminary decision.[1764] In this decision, we consider recent data.[1765] Table 3-61 sets out the median credit ratings across our comparator set since the 2006 calendar year end. These results differ from CEG's, which appear to end mid-2013. This is because:

- On 18 December 2013, ATCO Gas Australian LP was upgraded from BBB to A-
- On 18 December 2013, Powercor Australia LLC was downgraded from A- to BBB+
- On 20 December 2013, DUET Group became non-rated (NR) rather than having a credit rating of BBB-
- On 20 December 2013, AusNet Services was upgraded to A-, rather than BBB+
- On 20 December 2013, SGSP Australia Assets Pty Ltd was upgraded to BBB+, rather than BBB.
- On 28 November 2014, ElectraNet Pty Ltd was upgraded to BBB+ from BBB
- On 11 August 2014, Envestra Ltd was upgraded to BBB+ from BBB.

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debt response, 27 February 2015, pp. 5–10; Kanangra, *Credit ratings for regulated energy network services businesses*, June 2014.

1759 Kanangra, *Credit ratings for regulated energy network services businesses*, June 2014.

1760 Kanangra, *Credit ratings for regulated energy network service providers*, June 2013.

1761 AER, *Explanatory statement to the rate of return guideline*, 17 December 2013, pp. 156–157.

1762 JGN, *2015–20 Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, pp. 9–10. Ausgrid, Endeavour Energy and Essential Energy commissioned CEG, *WACC estimates*, May 2014, p. 64.

1763 For instance, ATCO moved up to A- on 18/12/2013, Envestra moved up to BBB+ on 11/8/2014, Powercor moved down to BBB+ on 18/12/2013, AusNet Services moved up to A- on 20/12/2013, SGSP moved up to BBB+ on 20/12/2013.

1764 JGN, Appendix 7.10: Return on debt response (public), 27 February 2015, p. 9.

1765 At the time of writing, this was data from 7 April 2015.

Table 3-61 Median 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+	BBB+
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+	BBB+
United Energy Distribution Pty Ltd	BBB	BBB	BBB	BBB	BBB	BBB	BBB	BBB	BBB	BBB
Median (year)	BBB/ BBB+	BBB/ BBB+	BBB+	BBB	BBB	BBB	BBB	BBB/ BBB+	BBB+	BBB+

Source: Bloomberg, Standard and Poor's, AER analysis.

Ergon Energy also mentioned that ratings agencies previously expressed concerns regarding our increased regulatory discretion. However, we are not satisfied that these concerns are currently held.[1766] Ergon Energy referenced a Standard and Poor's article from 2012, concerning the AEMC's draft rule change.[1767] Since that time, the AEMC finalised its rule change and we implemented a 'Better Regulation' program where we consulted heavily and developed guidelines that transparently set out how we would apply our regulatory discretion. In a more recent document, Moody's assessed two of the service providers we regulate. These service providers performed strongly under Moody's regulatory environment and asset ownership model. For service providers performing highly under this category, Moody's found this performance was:[1768]

> principally reflecting the high quality regulatory regimes where they operate, which reduces overall business risk. Such regulatory frameworks tend to be well established, provide timely cost recovery and have de-coupling mechanisms that limit volume risk.

H.1.3 Length of estimation period

We consider it is useful to have regard to variability in the median credit rating throughout time. This recognises the trade-off between using shorter term and longer term historical data. On one hand, shorter term data is more likely to reflect current expectations. On the other hand, longer term data may reduce the influence on the median from firm specific or idiosyncratic factors.

Service providers made different submissions on the length of the estimation period. Ergon Energy proposed the maximum horizon of historical credit rating analysis should be limited to five years.[1769] Energex proposed the credit rating be based on the most recent observations.[1770] ActewAGL, JGN and SAPN did not propose taking the median credit rating over a particular period.[1771] However, ActewAGL noted there had been a sustained drop in the median credit rating since 2009.[1772] Also, JGN indicated that considering median credit ratings over a longer time period is not appropriate, finding:[1773]

> Fundamental changes to the way energy is sourced and consumed mean that the risks faced by debt (and equity) holders have increased-which was reflected in recent downgrades and warnings by ratings agencies.

In response to these proposals, we note the following:

[1766] Ergon Energy, *Appendix C: Rate of return, Regulatory proposal*, October 2014, pp. 141–142.

[1767] Standard and Poor's, *Australian network utilities: Draft reforms give regulators more flexibility, but raise credit risks*, 22 October 2012, pp. 9–10.

[1768] Moody's Investors Service, *Rating methodology: Regulated electric and gas networks*, 25 November 2014, p. 34.

[1769] Ergon Energy, *Appendix C: Rate of return, Regulatory proposal*, October 2014, p. 140.

[1770] Energex, *2015–20 regulatory proposal*, October 2014, p. 167.

[1771] For example, see SAPN, *Regulatory proposal 2015–20*, October 2014, p. 338.

[1772] ActewAGL, p. 279; CEG, *Memorandum: Factors relevant to estimating a trailing average cost of debt*, 24 May 2014, p. 1.

[1773] JGN, *2015-20 Access Arrangement Information Appendix 9.10 Return on debt proposal*, 30 June 2014, p. 8.

- In this preliminary decision, we consider how the median credit rating has changed over different periods —from over the last decade to the current year. The majority of these time periods support a median credit rating of BBB+. As such, we have had regard to data over the short, medium and longer term.
- Even if we were to only consider the most recent credit rating observations, we consider these support a BBB+ credit rating. There had been a range of downgrades in credit ratings from 2009 that led the median credit rating to fall from BBB+ to BBB. However, ratings agencies have since revised many of these estimates. Since the latter half of 2013, there has been a range of upgrades and the median is back to BBB+.[1774]
- We do not consider JGN has shown that previous credit rating revisions were linked to factors relevant to the benchmark efficient entity. We note credit ratings agencies may revise ratings for a range of reasons, including firm-specific reasons.[1775]
- We propose to apply a benchmark credit rating of BBB+ for this regulatory control period. However, since independent data service providers publish data for a broad BBB band, we note this approach will allow for a generous return on debt allowance. Lally has also recognised this view, even though he considers the appropriate credit rating is BBB to BBB+.[1776] Various stakeholders have also recognised this view.[1777]

H.1.4 Private credit ratings and government firms

Some consumer groups submitted that applying a benchmark credit rating of BBB+ is generous to service providers that acquire debt from their parents with higher credit ratings.[1778] These proposals appear to primarily relate to government owned service providers. We do not agree with these proposals.

1774 The most recent ratings to be updated are: ATCO moved up to A- on 18/12/2013, Envestra moved up to BBB+ on 11/8/2014, Powercor moved down to BBB+ on 18/12/2013, AusNet Services moved up to A- on 20/12/2013, SGSP moved up to BBB+ on 20/12/2013.

1775 For instance, Envestra stated Standard and Poor's improved its credit rating in 2013 because of regulatory decisions and Envestra's reduced gearing. See Envestra, *Annual report 2013*, pp. 2, 6, 29. In 2013, Standard and Poor's lowered SGSP's credit rating following a change in ownership. See SGSP (Australia) Assets Pty Ltd, *Financial report for the year ended 31 March 2014*, p. 2.

1776 Lally, *Implementation issues for the cost of debt*, November 2014, p. 4.

1777 CCP, *Submission to AER: Responding to NSW draft determinations and revised proposals from electricity distribution networks*, February 2015, pp. 10–45; ECC, *Submission concerning the NSW distribution networks revised revenue proposal 2014–19: Submission to the AER*, 11 February 2015, p. 2; MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 55; SACES, *Independent estimates of the WACC for SAPN: Report commissioned by the SACOSS*, January 2015, pp. 13–14; ECC

1778 For example, Hugh Grant (CCP member), *CCP submission AER draft TransGrid determination, TransGrid revised revenue proposal*, 6 February 2015., pp. 12–13; ECC, *Submission concerning the NSW distribution networks revised revenue proposal 2014–19: Submission to the AER*, 11 February 2015, p. 2; MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 55.

The Energy Markets Reform Forum (EMRF) supported applying the Guideline. However, the EMRF and Norske Skog submitted that a BBB+ credit rating provides a significant benefit to service providers that acquire credit from their owners who face better rates.[1779] The Tasmanian Small Business Council (TSBC) submitted that government businesses do not face the same degree of risk as the benchmark efficient entity. It submitted that, 'this is inconsistent with incentive regulation, which is supposed to ensure that network entities do not benefit from windfall gains but rather benefit from the pursuit of greater efficiencies'.[1780]

We apply a credit rating of BBB+ to all service providers, regardless of their ownership structure. The rules specify to take a benchmark approach to setting the allowed rate of return.[1781] After careful analysis, we defined a benchmark efficient entity as, 'a pure play, regulated energy network business operating within Australia'.[1782] This definition of a benchmark efficient entity makes no assumption on ownership structure. In forming this position, we had regard to the following:

- In the Guideline, we considered systematic risks were likely to be similar between government owned and private service providers in providing standard control services.[1783]
- With respect to default risk, Klein has noted taxpayers underwrite the lower cost of debt for government-backed entities through the government's ultimate recourse to taxation. If governments were to compensate taxpayers for this risk, then there would be no capital cost advantage of government finance. The risk premium on government finance would, in principle, be no different to that of private investors.[1784] While the EMRF does not disagree with this, it submitted that using a private benchmark could only be efficient if the government returned the resulting the 'overpayment' to the taxpayer.[1785] One would expect this to hold if governments use the revenue from their investments to substitute revenue they would otherwise collect from taxpayers.
- The relevant issue is whether government ownership alters the risks of investing in and operating energy networks to provide standard control services. The AEMC has noted:[1786]

1779 EMRF, *AER review of NSW electricity transmission 2014*, July 2014, p. 28; EMRF, *AER review of NSW electricity distribution 2014*, July 2014, p. 33; Norske Skog Albury Mill, *NSW Electricity Transmission Revenue Reset: Response to TransGrid's Application*, p. 4.

1780 Tasmanian Small Business Council, *Submission to the AER: TasNetworks transmission revenue reset — Draft determination & revised proposal*, February 2015, p. 32.

1781 Specifically, the allowed rate of return must be commensurate with the efficient financing cost of a benchmark efficient entity. See NER cl. 6.5.2(c), 6A.6.2(c); NGR r. 87(3).

1782 See AER, *Explanatory statement to the rate of return guideline*, 17 December 2014, pp. 30–45.

1783 AER, *Explanatory statement to the rate of return guideline*, 17 December 2013, p. 44.

1784 Klein, M., 'The risk premium for evaluating public projects', *Oxford Review of Economic Policy*, Vol. 13, No. 4, pp. 29–42.

1785 EMRF, *NSW electricity transmission revenue reset: AER draft decision and TransGrid revised proposal*, January 2015, p. 23.

1786 AEMC, *Rule determination: Economic Regulation of Network Service Providers*, 29 November 2012, p. v.

> The interest rates that State treasury corporations can secure reflect the credit rating of the relevant state government and not the service provider. If state-owned service providers were to access debt capital markets directly then they would face debt financing costs that reflect their stand-alone credit ratings. If such costs are not reflected in the regulatory framework then investment and resource allocation decisions may be distorted. The Commission considers that the most appropriate benchmark to use in the regulatory framework for all service providers, regardless of ownership, in general is the efficient private sector service provider.

H.1.5 Credit ratings as an indicator of the return on debt

Consumer groups submitted evidence suggesting credit ratings for utility bonds often poorly estimate the likely costs.[1787] In particular, lenders are willing to lend at lower rates because they value the stability of utility earnings.

We consider there is merit in this submission. However, at this stage, we predominately base our approach to estimating the benchmark return on debt on a benchmark credit rating and term to maturity. This is because:

- We use third party data series to estimate the return on debt. We are satisfied there are important benefits with adopting this approach, rather than constructing our own series and yield curve (see section 3.4.2 and section H.2). However, third party data service providers define their series on credit ratings and terms. To date, data service providers have not published a utility-specific data series.
- We recognise the credit rating and term to maturity are factors in determining the return on debt.
- Ideally, we could use a cohort of bonds that are comparable to those sourced by businesses similar to the benchmark efficient entity. However, for practical reasons, at this time we do not have a clear and unambiguous approach for factoring in these qualitative factors. In particular, we would need to achieve this whilst allowing for updating the annual revenue requirement through the automatic application of a formula.[1788]

Further, EMRF and MEU submitted our approach has an additional layer of conservatism because it assumes service providers only raise debt using corporate bonds.[1789] EMRF submitted this will overstate service providers' efficient costs because

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[1787] CCP, *Jam Tomorrow? Submission regarding NSW DNSP regulatory proposals 2014-19*, August 2014, pp. 18, 26.; EMRF, *AER review of NSW electricity distribution 2014*, July 2014, p. 37; EMRF, *AER review of NSW electricity transmission 2014*, July 2014, p. 33; EUAA, *Submission to TransGrid response to draft determination (2014 to 2019)*, 6 February 2015, p. 5;Hugh Grant (CCP member), *CCP submission AER draft TransGrid determination, TransGrid revised revenue proposa*l, 6 February 2015, p. 12.

[1788] NER 6.5.2(l), 6A.6.2(l); NGR 87(12).

[1789] EMRF, *NSW electricity transmission revenue reset: AER draft decision and TransGrid revised proposal*, January 2015, p. 22; MEU, *Tasmanian electricity transmission revenue reset, AER draft decision and TasNetworks revised proposal: A response*, February 2015, p. 22

corporate bonds are a higher cost source of debt than what is available from other sources.[1790] We agree that this is a conservative aspect of our approach. However, Lally advised that the impact of this may be mitigated given, 'bank debt constitutes only about 25% of the debt of regulated firms'.[1791] Similarly, while PwC observed Australian listed regulated energy networks held an average of 27 per cent bank debt in 2012, it also noted:[1792]

> bank debt may be preferred at terms below 5 years because it is likely to be cheaper than bonds at those terms, while very little bank debt is issued for terms beyond 5 years because capital market sources (bonds) are cheaper at those terms to maturity.

H.2 Use of third party data series

Our preliminary 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.[1793] The service provider proposals currently before us proposed using third party data series to estimate the return on debt.[1794] The revised proposals before us also proposed using third party data series to estimate the return on debt.[1795] However, some consumer groups did not support this approach. We discuss these submissions here.

The CCP raised concerns that the use of current third party data series would overstate the efficient financing costs of a benchmark efficient entity. The CCP suggested that actual borrowing costs are lower than what our rate of return allowance indicates. We are not satisfied with the information the CCP used to support this position. This is because the CCP referred to:

- Information from Lally, Chairmont and the Energy Users Rule Change Committee, which it had submitted to us previously.[1796] We have considered this information previously. However, we considered that using a third party data series was a practical necessity resulting from the choice to annually update the return on debt. We also considered that annually updating the return on debt would reduce the

[1790] EMRF, *NSW electricity transmission revenue reset: AER draft decision and TransGrid revised proposal*, January 2015, p. 22.

[1791] Lally, *Implementation issues for the cost of debt*, 20 November 2014, p. 3.

[1792] PwC, *A cost of debt estimation methodology for businesses regulated by the QCA*, June 2013, p. 57.

[1793] AER, *Explanatory statement to the rate of return guideline*, December 2013, pp. 126–130.

[1794] Energex, *Regulatory proposal*, October 2014, p. 153; Ergon Energy, *Appendix C: Regulatory proposal*, October 2014, p. 124; SAPN, *Regulatory proposal*, October 2014, p. 339.

[1795] ActewAGL, *Revised regulatory proposal*, January 2015, p, 428; Ausgrid, *Revised regulatory proposal and preliminary submission*, January 2015, p, 178; Directlink, *Revised revenue proposal*, January 2015, p, 13; Endeavour Energy, *Revised regulatory proposal*, January 2015, p, 200; Essential Energy, *Revised regulatory proposal*, January 2015, p, 219; JGN, 2*015–20 access arrangement: Response to the AER's draft decision and revised proposal, Appendix 7.10 — Return on debt response*, February 2015, p. 1; TasNetworks, *Revenue proposal*, May 2014, p. 108; TransGrid, *Revised revenue proposal*, January 2015, p. 116.

[1796] CCP, *Smelling the roses and escaping the rabbit holes: The value of looking at actual outcomes in deciding WACC*, July 2014, p. 12.

potential mismatch between the actual and allowed return on debt of the benchmark efficient entity.[1797] Further, in its latest report, Chairmont's analysis indicated that using a simple average of RBA and Bloomberg was a fair approach.[1798] Also, in his recent report on debt implementation, Lally advised:[1799]

> the bonds of regulated energy network businesses would have lower average liquidity than the bonds in the BVAL and RBA sets, and are also likely to have lower than normal expected loss rates for bondholders in the event of default. The first point would lead to the BVAL or RBA indexes underestimating the cost of debt for regulated energy network businesses with the same credit ratings whilst the second point would lead to an overestimate. The net effect of these two points is not known.

- The opinion of 'major investment banks and equity analysts' that the long run average cost of debt was around five per cent.[1800] Before using this information, we would need to verify this number. However, the CCP submitted that it could not provide us this information because of confidentiality considerations. Therefore, it is difficult to verify the accuracy of this information. In addition, we would also need to ensure that this information is a like-for-like comparison to the regulatory benchmark. In particular, our return on debt approach is to adopt an on-the-day rate for the first regulatory year (and gradually transition this into a trailing average). The on-the-day rate reflects prevailing market conditions. Accordingly, it is not directly comparable to the long run average cost of debt stated by the CCP.

In submissions on the current and revised regulatory proposals, consumer representatives proposed we develop our own data series, using either:

- A selection of benchmark bonds that target more features than the benchmark credit rating and benchmark debt term. In particular, consumer representatives submitted that the bonds included in the sample should reflect the industry of regulated utilities, given the view that the return on debt varies with the core business of firms.[1801]
- Service providers' actual borrowing costs.[1802]

1797 For example, see AER, *Draft decision: ActewAGL distribution determination, Attachment 3*, November 2014, p. 135/.

1798 Chairmont, *Cost of debt: Transitional analysis*, 18 March 2015, pp. 67–68.

1799 Lally, *Implementation issues for the cost of debt*, October 2014, p. 4.

1800 CCP, *Submission to AER on QLD/SA distributors' proposals*, January 2015, p. 10; CCP, *Response to the AER draft determination re: ActewAGL regulatory proposal 2014–19*, February 2015, p. 23; CCP, *Responding to NSW draft determinations and revised proposals from electricity distribution networks*, February 2015, 45.

1801 ECCSA, *AER SA electricity distribution revenue reset SAPN application: A response*, December 2014, p. 80; EMRF, *AER review of NSW electricity transmission*, July 2014, pp. 32–34; MEU, *Tasmanian Electricity Transmission Revenue Reset, TasNetworks Application: A response*, August 2014, pp. 34–35; Tasmanian Small Business Council, *Submission on TasNetworks revenue proposal*, 8 August 2014, p. 42.

1802 Bruce Mountain (CCP member), *CCP submission to AER on QLD/SA distributors' proposals*, January 2015, p. 10; CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2014, p. 6.

- The CCP submitted that considering actual costs would be valuable because:[1803]

> …the evidence from the actual yields on network bonds and the price paid for bank debt shows that network businesses' actual borrowing costs are much lower than implied by their credit ratings. This is because lenders recognise that networks are monopolies and…lenders are willing to lend money to network utilities at much lower rates than implied by their credit ratings.

We acknowledge the views of consumer representatives on this issue. We also share some of the concerns of relying heavily on credit ratings, and not industry, as the measure of risk for estimating the return on debt of the benchmark efficient entity.[1804] As such, our preference would be to use a third party utilities data series, rather than broad BBB data series. For this reason, we would consider using such a series if it becomes available from Bloomberg or the RBA.

However, we consider that using a third party data series is a practical necessity resulting from the choice to annually update the return on debt. We have chosen to annually update the return on debt. This reduces the volatility of prices between regulatory periods by introducing a small degree of price volatility within the regulatory period. This also reduces the potential mismatch between the actual and allowed return on debt of the benchmark efficient entity. At the end of the Guideline development process, the majority of stakeholders (including both service providers and consumer representatives) supported annually updating the return on debt.[1805] In other words, calculating an index of actual borrowing costs might be feasible under an on-the-day approach, but it would be practically difficult to apply using a trailing average approach. And so there is a trade-off here.

Further, we do not apply a benchmark or data series based on service providers' actual borrowing costs. In its submission, the CCP did not suggest precisely how we should use this data.[1806] In our draft decisions published in November 2014, we raised challenges in implementing this approach and specified that we would not apply this approach unless we had a sound idea of how to implement it well.[1807] In its submission to our draft decision for TasNetworks, the Tasmanian Small Business Council (TSBC)

1803 CCP, *Submission to AER on QLD/SA distributors' proposals*, January 2015, p. 10; CCP, *Response to the AER draft determination re: ActewAGL regulatory proposal 2014–19*, February 2015, p. 23; CCP, *Responding to NSW draft determinations and revised proposals from electricity distribution networks*, February 2015, 45.

1804 For example, Lally explains that there are a 'host of other factors' that affect the debt risk premium but not the credit rating. Lally, *Implementation issues with the cost of debt*, pp.32-34.

1805 Consumer representatives such as COSBOA, EUAA and MEU supported annual updating. Service providers (and their representatives) such as APA Group, the ENA, Envestra, Ergon Energy, QTC and SP AusNet supported annual updating. On the other hand, consumer representatives such as the NSW irrigators' council did not support annual updating and PIAC did not express a strong preference either way. See AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2014, p. 196.

1806 CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2013, p. 3.

1807 See for example AER, *Draft decision ActewAGL distribution determination — Attachment 3: Rate of return*, November 2014, p. 136.

responded to the challenges we raised.[1808] . After considering TSBC's submission, we are still satisfied with our position in the draft decision. This is for the following reasons:

- We have previously recognised that if we were to use historical actual debt costs to estimate future allowances, we would also want to account for changes in the financial environment since the historical period. We are unsure of how to best achieve this at this stage. We acknowledge TBSC's suggestion to seek expert advice on this matter. We accept it is possible to use historical costs to estimate future allowances. We also appreciate, like estimating many financial parameters, there will likely be difficulties with producing reliable estimates.

- If we were to use current actual debt costs at the time of the reset or annual update, we would need detailed and timely data. We do not currently have access to this level of detailed data. Even if we did, we would need to consider how best to use this data to construct a 'current' benchmark return on debt. We acknowledge TSBC's suggestion to obtain relevant and timely information through regulatory information notices (RINs) and other government sources. While there may be potential to use RINs in this way, we are not convinced this is a pragmatic option for the current resets that are before us.

- If we were to base the allowed return on debt on actual costs, we would need to consider how this might affect service providers' incentives to minimise their debt costs. Further, we would have to be careful to apply this approach consistently with the allowed rate of return objective, which refers to a benchmark.[1809] We recognise TSBC's view that developing an appropriate benchmark would negate blunting incentives. The CCP shared a similar view and likened this to establishing an allowance for operating expenditure based on a benchmark of actual costs.[1810] While we do not necessarily disagree, we also appreciate that developing an effective benchmark will have its challenges and may not be a pragmatic option for the currently open resets.

- If we were to base debt allowances on actual costs, we would have to carefully consider whether or not we should include the costs of public sector service providers, as the CCP proposed.[1811] We consider that data for government owned service providers may provide some insight for benchmarking purposes. However, we also recognise there may be limitations to using this information. This is because:
    - The AEMC has concluded an efficient private sector service provider is the most appropriate benchmark. [1812] Synergies Economic Consulting concurred with this view.[1813]

[1808] For TSBC's response, see TSBC, *Submission to the AER: TasNetworks transmission revenue reset — Draft determination & revised proposal*, February 2015, pp. 32–34.

[1809] NER, cl. 6A.6.2(c), NER, cl. 6.5.2(c), and NGR, r. 87(3).

[1810] Bruce Mountain (CCP member), *CCP submission to AER on QLD/SA distributors' proposals*, January 2015, p. 10.

[1811] CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2013, p. 12.

[1812] AEMC, *Final rule change determination*, November 2012, p. 72.

- If we were to include the actual debt costs of government owned service providers in our benchmark, we would include debt guarantee fees. Excluding debt guarantee fees would not be consistent with setting a commercial rate of return. This is because these are intended to reflect a business's indicative, stand-alone credit rating or commercial status.[1814] Nevertheless, we acknowledge that debt guarantee fees are based on estimates and are not 'actual' costs determined by capital markets. For example, NSW TCorp uses a third party data series (RBA) to calculate debt fees. Therefore, these estimates may still be subject to consumer groups' concerns regarding the use of third party data series.

However, we do consider it may be useful to have some regard to service providers' historical actual borrowing costs. This information can help us assess how our regulatory approach has performed systematically over time. For instance, this could help us identify aspects of our regulatory approach we could refine in future Guideline reviews.

H.3 Choice of data series

This section sets out in greater detail our analysis of issues relating to the choice and implementation of third party data to estimate the return on debt.

H.3.1 Assessment of third party data series against the rate of return criteria

In the Guideline, we set out a number of criteria that we would use to assess the merits of various sources of information we would have regard to in estimating the allowed rate of return.[1815] Following the Guideline, we released an issues paper elaborating on the choice of a third party data service provider.[1816] In this issues paper, we set out the means by which these criteria could guide our analysis of this specific issue.[1817] Table 3-62 sets out our evaluation of each curve and a combination of curves against each of these criteria. In this case, the relevant benchmark we seek to estimate is the return on debt corresponding to a BBB+ rated bond with 10 years term to maturity. Further, in the Guideline, we define the benchmark efficient entity as 'a pure play, regulated

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1813 Synergies, *Response to issues raised by the CCP: Report for Ergon Energy*, September 2014, pp. 15–16.

1814 NSW Treasury, *Policy statement on the application of competitive neutrality: Policy & guidelines paper*, January 2002, p. 11; Queensland Government, N*CP implementation in Queensland: Competitive neutrality and Queensland government business activities*, July 1996, p. 24; ACT Department of Treasury, *Competitive neutrality in the ACT*, V. 2, October 2010, p. 10. We note that our interpretation of State government policy appears to differ from Origin Energy who submitted, 'for regulated utilities, the guarantee fee rate is determined using the debt tenor adopted by the regulator's debt allowance benchmark tenor'. See Origin Energy, *Submission to AER TransGrid draft determination*, 6 February 2015, p. 7.

1815 AER, *Explanatory statement*‑*Rate of return guideline*, December 2013, pp. 23–24.

1816 AER, *Return on debt*‑*Choice of third party data service provider: Issues paper*, April 2014.

1817 AER, *Return on debt*‑*Choice of third party data service provider: Issues paper*, April 2014, p. 11.

energy network business operating within Australia'.[1818] These are the benchmark characteristics against which we have evaluated the suitability of the two curves.

The analysis leading us to these conclusions is set out more fully in section 3.4.2 of attachment 3.

Table 3-62 Assessment of curve options against the rate of return criteria

Criteria	BVAL curve	RBA curve	Combination of curves
Where applicable, reflective of economic and finance principles and market information: • estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data.	We are reasonably satisfied the BVAL curve's bond selection criteria reflect economic and finance principles and market information. There is relatively limited information available about the BVAL curve's proprietary curve fitting methodology. However, the available information is sufficiently consistent with accepted economic and finance principles. In particular, the BVAL curve is a par yield curve and this is consistent with the building block framework.	We are reasonably satisfied the RBA curve's bond selection criteria reflects economic and finance principles and market information. However, the RBA curve is not a par yield curve. A par yield curve is consistent with the building block framework.	We are satisfied a combination of curves is reasonably likely to lower the mean squared error (MSE), compared to using only one curve, and that is informed by well accepted economic and finance principles.
Fit for purpose: • the use of estimation methods, financial models, market data and other evidence should be consistent with the original	The BVAL curve is a par-yield curve,[1819] which is consistent with the task of estimating the return on debt within the	The RBA curve is an average of bond spreads with weights depending on target tenor. It is not a par yield curve, however	Using the two individual estimates as inputs, we are satisfied the simple average draws on the combined range of

[1818] AER, *Rate of return guideline*, 17 December 2013, p. 7.

[1819] REU, *Return on debt estimation: a review of the alternative third party data series*, August 2014, p. 32; Lally, *Implementation issues for the cost of debt*, November 2014, pp.17-19.

Criteria	BVAL curve	RBA curve	Combination of curves
purpose for which it was compiled and have regard to the limitations of that purpose • promote simple over complex approaches where appropriate.	building block framework. Based on the limited publicly available information, we also understand the BVAL curve is "some form of local linear regression with subsequent smoothing".[1820] However, the proprietary curve fitting methodology is less transparent than the RBA's, limiting our ability to make a full assessment.	the materiality of this shortcoming is likely to be small and would not systematically overestimate or underestimate compared to a par yield curve.[1821]	market information having regards to its strengths and limitations, and uses a simple, fit-for purpose approach to produce an overall estimate that minimises the MSE.
Implemented in accordance with good practice: • supported by robust, transparent and replicable analysis that is derived from available, credible datasets	The BVAL curve's bond selection criteria are highly transparent and replicable. However, its curve fitting methodology is proprietary. Nonetheless, we are satisfied the underlying Bloomberg BVAL dataset is credible. As summarised by REU, the BVAL dataset is widely used and well supported.[1822] Further, we note that the RBA also uses primarily the BVAL	The RBA methodology is generally transparent. We are satisfied it is also credible. There remain some issues where technical specifics of the RBA's approach are unclear, however we may seek to resolve these issues with the RBA in future.	The combination of curves is a simple transformation of the two individual curves. We are satisfied the approach is well supported by Lally's analysis on the minimisation of MSE.[1824]

1820 REU, Return on debt estimation: a review of the alternative third party data series, August 2014, p. 13.

1821 Lally, *Implementation issues for the cost of debt*, November 2014. P. 17-19.

1822 REU, Return on debt estimation: a review of the alternative third party data series, August 2014, p. 16.

Criteria	BVAL curve	RBA curve	Combination of curves
	dataset in estimating its curve.[1823]		
Where models of the return on equity and debt are used these are: • based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to errors in input estimation • based on quantitative modelling which avoids arbitrary filtering or adjustment of data which does not have a sound rationale.	Based on our analysis we conclude that the BVAL bond selection criteria are sufficiently robust and avoid arbitrary filtering. However, the Bloomberg curve fitting methodology is not transparent, so we are limited in the assessment we can make.	Based on our analysis we conclude that the RBA bond selection criteria are sufficiently robust and avoid arbitrary filtering. Similarly, while the RBA's curve fitting methodology has some shortcomings, we are satisfied it is sufficiently robust as to not be unduly sensitive to errors in input estimation.	We are satisfied the simple average of the two curves will decrease the extent to which the overall estimate is sensitive to shortcomings in either of the two underlying curves. Further, we are satisfied it avoids what would be an arbitrary selection of one curve over the other, when neither is clearly superior.
Where market data and other information is used, this information is: • credible and verifiable • comparable and timely • clearly sourced.	Bloomberg's data is available daily, and it lists the specific curve constituents.[1825] This contributes to the BVAL curve being timely, verifiable, comparable and clearly sourced. However, the BVAL curve is only published to 7 years.[1826] This means that we must extrapolate the BVAL curve to ensure it is comparable with our	In its Bulletin article, the RBA specified its hierarchy of data sources for underlying bond data. Its first preference is to source bond data from Bloomberg BVAL data service. However, the RBA only publishes its curve on one day a month, meaning it is not timely.	To the extent the data in the underlying curves meets this criterion, the simple combination will also. Further, our proposed approach obtains daily estimates from RBA data by interpolation. This improves the comparability and timeliness of the estimate relative to the underlying RBA curve.

1824 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 19-22.

1823 Arsov, Brooks and Kosev, 'New measures of Australian corporate credit spreads', *RBA bulletin*, December 2013.

1825 By 'curve constituents' we refer to the data points used in the calculation of its BVAL curve each day

1826 As identified in attachment 3, the BVAL curve was published to 7 years for the 2014–15 estimates. However, at the time of this decision, the BVAL curve is only published to 5 years. However, Bloomberg has indicated that it is likely to soon commence publishing the BVAL curve out to terms exceeding 10 years with an updated methodology.

Criteria	BVAL curve	RBA curve	Combination of curves
	benchmark.		
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	Bloomberg updates its curve daily, allowing great flexibility in response to changing market conditions.	The RBA only publishes its data on one day per month, and this limits the flexibility and responsiveness of the RBA data to changing market circumstances.	Our approach combines the BVAL curve's daily estimates with the daily estimates obtained from the RBA curve by interpolation. We are satisfied it is sufficiently flexible to reflect changing market circumstances in regulatory outcomes.

Source: AER analysis.

I Methodology to annually update the return on debt

Our preliminary 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 (2015–16) of the 2015–20 period, and
- gradually transition this rate into a trailing average approach (that is, a moving historical average) over 10 years.[1827]

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.[1828] The NER require that the resulting change to Energex's annual building block revenue requirement is to be effected through a formula specified in the distribution determination.[1829] For the purposes of clause 6.5.2(L), our preliminary decision is that the resulting change to Energex's annual building block revenue requirement is to be effected through:

- the automatic application of the return on debt methodology specified in this appendix (appendix I)
- using the return on debt averaging periods specified in confidential appendix K, and
- implemented using Energex's final determination post-tax revenue model (PTRM) in accordance with section 3 of the AER's PTRM handbook for distribution network service providers.[1830]

The return on debt methodology in this appendix specifies our preliminary decision:

- methodology on the return on debt approach, and
- methodology to implement the return on debt approach

I.1 Approach to estimating the return on debt

This section sets out our preliminary 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:

1827 This preliminary decision determines the return on debt methodology for the 2015–20 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.

1828 NER, cl.6.5.2(i) and cl.6A.6.2(i).

1829 NER, cl.6.5.2(l) and cl. 6A.6.2(l).

1830 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 I.2 and Energex's return on debt averaging periods specified in confidential appendix K

$_{b}kd_{b+1}$ refers to the allowed return on debt for regulatory year b+1.

In the first regulatory year (2015–16), 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:

$$_{5}kd_{6} = 0.5 \cdot {}_{0}R_{10} + 0.1 \cdot {}_{1}R_{11} + 0.1 \cdot {}_{2}R_{12} + 0.1 \cdot {}_{3}R_{13} + 0.1 \cdot {}_{4}R_{14} + 0.1 \cdot {}_{5}R_{15}$$

$$_{6}kd_{7} = 0.4 \cdot {}_{0}R_{10} + 0.1 \cdot {}_{1}R_{11} + 0.1 \cdot {}_{2}R_{12} + 0.1 \cdot {}_{3}R_{13} + 0.1 \cdot {}_{4}R_{14} + 0.1 \cdot {}_{5}R_{15} + 0.1 \cdot {}_{6}R_{16}$$

$$_{7}kd_{8} = 0.3 \cdot {}_{0}R_{10} + 0.1 \cdot {}_{1}R_{11} + 0.1 \cdot {}_{2}R_{12} + 0.1 \cdot {}_{3}R_{13} + 0.1 \cdot {}_{4}R_{14} + 0.1 \cdot {}_{5}R_{15} + 0.1 \cdot {}_{6}R_{16} + 0.1 \cdot {}_{7}R_{17}$$

$$_{8}kd_{9} = 0.2 \cdot {}_{0}R_{10} + 0.1 \cdot {}_{1}R_{11} + 0.1 \cdot {}_{2}R_{12} + 0.1 \cdot {}_{3}R_{13} + 0.1 \cdot {}_{4}R_{14} + 0.1 \cdot {}_{5}R_{15} + 0.1 \cdot {}_{6}R_{16} + 0.1 \cdot {}_{7}R_{17} + 0.1 \cdot {}_{8}R_{18}$$

$$ {}_{9}kd_{10} = 0.1 \cdot \ {}_{0}R_{10} + 0.1 \cdot \ {}_{1}R_{11} + 0.1 \cdot \ {}_{2}R_{12} + 0.1 \cdot \ {}_{3}R_{13} + 0.1 \cdot \ {}_{4}R_{14} + 0.1 \cdot \ {}_{5}R_{15} + 0.1 \cdot \ {}_{6}R_{16} + 0.1 \cdot \ {}_{7}R_{17} + 0.1 \cdot \ {}_{8}R_{18} + 0.1 \cdot \ {}_{9}R_{19} $$

I.2 Implementing the return on debt approach

This section sets out our preliminary 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

I.2.1 Choice of data series

Our preliminary decision on the choice of data series is to adopt a simple average of the debt data series published by the Reserve Bank of Australia (RBA) and Bloomberg that match, as close as available, our benchmarks of a BBB+ credit rating and a 10 year debt term. Specifically our preliminary 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.[1831]
    - 7 year estimate extrapolated to a 10 year term using the 7–10 year margin from the RBA curve.
    - 5 year estimate extrapolated to a 10 year term using the 5–10 year margin from the RBA curve.

I.2.2 Choice of data series—Extrapolation and interpolation issues

Our preliminary decision on extrapolation and interpolation issues is to adopt the same approach we adopted our final decisions for NSW service providers, published in April 2015. This refers to:

[1831] 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.

- 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 3-63 and Table 3-64.

Table 3-63 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.[1832] 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 preliminary decision on the annual debt update process is set out in the annual debt update process section of attachment 3.
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).[1833] 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

[1832] 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.

[1833] Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

Adjustment Type	Amendment made?	Comments
		debt. However, we do not agree it is necessary to extrapolate the base component. As identified by the RBA and Lally,[1834] 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'.[1835] 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 3-64 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.[1836] In April 2015, Bloomberg revised its methodology for the BVAL curve (BVCSAB10) and it now publishes a 10 year estimate.[1837] 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

[1834] 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.

[1835] RBA, *Email in response to: AER follow up question on the basis of YTM quotations in RBA statistical table F3*, 16 October 2014.

[1836] Specifically, from 15 September 2014 to 3 November 2014.

[1837] Specifically, 14 April 2015.

Adjustment Type	Amendment made?	Comments
		spread to CGS from 7 to 10 years As recommended by Lally,[1838] we are satisfied this approach is comparably reliable to the more complex approaches submitted by other stakeholders,[1839] 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.

I.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 preliminary 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 I.2.4.

Calculation of the adjusted RBA estimate

1. Download RBA table F3—'Aggregate measures of Australian corporate bond yields' from the RBA website.
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

[1838] Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38–44.
[1839] Incenta, *Methodology for extrapolating the debt risk premium*, June 2014, pp. 2–3.

c. all published dates between a. and b.

3. Download, from RBA table F16—'Indicative Mid Rates of Commonwealth 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,[1840] and the two nearest CGS bonds straddling 10 years remaining term to maturity. This should be done using the following formula: [1841]

   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:[1842]

   yield_{10} = yield_{10} year published + [(spread to swap_{10} year published - spread to swap_{7} year published)/(effective term_{10} year published - effective term_{7} year published)] * (10 - effective term_{10} 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:[1843]

   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.[1844]

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:

[1840] 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.

[1841] 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.

[1842] As per Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

[1843] As per Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

[1844] 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 with an estimate of the spread calculated correctly with reference to both the RBA's yield estimate and our estimate of CGS.

spread interpolated = spread first straddling publication date + (date interpolation - date first straddling publication date) * (spread second straddling publication date - spread first straddling publication date) / (date second straddling publication date - date 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:1845

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 (BVCAB10). 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.[1846]

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 steps 5 and 6 of the RBA process). This is the extrapolated daily estimate of the BVAL 10 year yield.[1847]

3. For all dates, convert the 10 year yields into effective annual rates, using the formula:

[1845] 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'.

[1846] Subject to the availability of the Bloomberg BVAL curve. For other contingencies, see section I.2.4.

[1847] 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.

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.

I.2.4 Choice of data series—Contingencies

Our preliminary decision is to apply the set of contingencies set out under Table 3-65.

We have made our preliminary decision based on the information and third party data that is currently available. Nonetheless, in our experience it is common that the availability of third party data changes. Our preliminary decision is to annually update the trailing average portfolio return on debt. Under the NER,[1848] the change in revenue resulting from the annual update must occur by automatic application of a formula that is specified in the determination. 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 or discretion. For this reason, we have set out a series of contingencies in Table 3-65, 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 3-65 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.	We will not apply estimates from a third party data provider that we have not evaluated and included during the determination process. 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.
Bloomberg reduces the maximum published BVAL term from 7 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. We have adopted this approach for the period from 15

[1848] NER, cl. 6A.6.2(l), NER, cl. 6.5.2(l).

Event	Changes to approach
	September 2014 to 3 November 2014 where the 7 year BVAL curve was unavailable. 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,1849 from the RBA's longest published effective 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.
Bloomberg increases the maximum published BVAL term from 7 years.	If the longest published term is between 7–10 years, we will extrapolate it to a 10 year term using the corresponding margin from the RBA curve. If the longest term is 10 or more years, we will apply the 10 year BVAL curve un-extrapolated, but still adjusted to be an effective annual rate.
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 NER 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.[1850] However, this is not possible during the regulatory control period. In these circumstances, we

[1849] Specifically, the spread to CGS.
[1850] AER, *Explanatory statement–Rate of return guideline*, December 2013, pp. 23–24.

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.

J 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 within 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 within the capex forecast because these costs are only incurred once and would be associated with funding the particular capital investments included within our capex forecast.

In the opex attachment we included our preliminary decision forecast for debt raising costs, and in the capex attachment we included our preliminary decision forecast for equity raising costs. In this appendix, we set out our assessment approach and the reasons for those forecasts.

J.1 Equity raising costs

Energex has applied our established method in proposing that it will not incur equity raising costs for the 2015-20 period.[1851] Therefore, we accept Energex's proposal and provide no allowance for equity raising costs in the 2015-20 regulatory control period.

Equity raising costs are transaction costs incurred when service providers raise new equity from outside the business. Our equity raising cost benchmark allows for the costs of dividend reinvestment plans and seasoned equity offerings. Equity raising costs are an unavoidable aspect of raising equity that would be incurred by a prudent service provider acting efficiently. 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 Guideline does not set out an approach for estimating equity raising costs, we have previously applied an established method for estimating these costs. We initially based our method for determining benchmark equity raising costs on advice in 2007 from Allen Consulting Group (ACG).[1852] We amended this method in our decisions for the ACT, NSW and Tasmanian electricity service providers.[1853] We have applied this method in subsequent decisions for other electricity and gas service

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1851 Energex, *6.PTRM - Standard Control*, October 2014.

1852 ACG, *Estimation of Powerlink's SEO transaction cost allowance-Memorandum*, 5 February 2007.

1853 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.

providers.[1854] This approach has been further refined, as discussed and applied in the Powerlink final decision.[1855]

J.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 aspect of raising debt that would be incurred by a prudent service provider, and data exists such that we can empirically estimate these costs. Accordingly, we provide an allowance to recover an efficient amount of debt raising costs.

J.2.1 Preliminary decision

We disagree with Energex's approach to debt raising costs. We also disagree with other components of Energex's opex forecast. However, our alternative total opex forecast is similar to the total opex forecast submitted by Energex, despite the differing methodologies on some components of opex.

Accordingly, as set out section 7.1 of the operating expenditure attachment, we accept Energex's proposed total opex allowance in its entirety. This includes its proposed debt raising cost allowance of $37.1 million (nominal) over the 2015–20 period, as set out in Table 3-66. Similarly, we accept Energex's proposed metering and public lighting opex in its entirety, including its proposed debt raising costs. Our preliminary decision on debt raising costs in total is set out in Table 3-66.

Table 3-66 AER's preliminary decision on debt raising costs (million, $ nominal)

	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Distribution	6.7	7.1	7.4	7.8	8.1	37.1
Metering	0.2	0.2	0.2	0.2	0.2	1.1
Public Lighting	0.1	0.1	0.1	0.1	0.1	0.4
Total	7.0	7.4	7.7	8.1	8.4	38.6

Source: AER analysis.

Note: Columns may not sum to rounding for presentation of table.

[1854] AER, *Final decision, Victorian electricity distribution network service providers, Distribution determination 2011–2015,* October 2010; AER, *Final Decision, Jemena Gas Networks, Access arrangement proposal for the NSW gas networks ,1 July 2010 – 30 June 2015*, June 2011.

[1855] AER, *Final decision, Powerlink Transmission determination 2012-13 to 2016-17*, April 2012, pp. 151-152.

J.2.2 AER's assessment approach

Our standard approach to forecasting debt raising costs is based on the approach in a report from the Allen Consulting Group (ACG),[1856] commissioned by the ACCC in 2004. Energex has relied on a method largely consistent with the ACG approach. Specifically, it has relied on updated market data from 2008–13, as submitted in a recent report by PwC during the rate of return guideline process.[1857] The approach uses a five year window of up to date bond data to reflect current market conditions. Where PwC has updated the data or the method, we have compared it against our standard approach and we are broadly satisfied it is reasonable.

The ACG method involves calculating the benchmark bond size, and the number of bond issues required to rollover the benchmark debt share (60 per cent) of the RAB. Our standard approach is to amortise the upfront costs that are incurred using the relevant nominal vanilla WACC over a ten year amortisation period. This is then expressed in basis points per annum (bppa) as an input into the post-tax revenue model (PTRM). This rate is multiplied by the debt component of a service provider's projected RAB to determine the debt raising cost allowance. The ACG approach recognises that credit rating costs can be spread across multiple bond issues, which lowers the benchmark allowance (as expressed in bppa) as the number of bond issues increases. In comparing PwC's updated approach to our standard approach, we have considered whether any updates contribute to a realistic estimate of Energex's efficient costs.

J.2.3 Reasons for preliminary decision

As set out section 7.1 of the operating expenditure attachment, we accept Energex's proposed opex allowance in its entirety. This includes its proposed debt raising cost allowance of $37.1 million (nominal) over the 2015–20 period, as set out in Table G 1.

Specifically, Energex proposed three distinct categories of debt raising costs. Our decisions on the categories are as follows:

- debt raising transaction costs— we are satisfied Energex's proposed debt raising transaction cost method quantifies the efficient input costs required to achieve the opex objectives. While we accept Energex's proposed method for determining debt raising transaction costs, we have made changes to its projected RAB value through the 2015–20 period. This in turn results in changes to the debt component of Energex's combined RABs.[1858] This debt component is an input into Energex proposed debt raising cost method and consequently affects the estimated amount of debt raising costs. Similarly, we have made changes to Energex's rate of return, which affects calculation of specific debt raising transaction cost line items.

[1856] The Allen Consulting Group, Debt and equity raising transaction costs: Final report, December 2004.

[1857] PricewaterhouseCoopers, Energy Networks Association: Debt financing costs, June 2013, p. i.

[1858] This includes the RAB values for all PTRMs where Energex has proposed to recover debt raising costs. This includes its distribution, metering and public lighting PTRMs.

- Liquidity costs—we are not satisfied that Energex's proposed liquidity costs contribute to a realistic expectation of the input costs required to achieve the opex objectives. We have removed these other debt raising costs from Energex's benchmark rate of debt raising costs.
- Three month ahead financing—we are not satisfied that Ergon Energy's proposed three month ahead financing contribute to a realistic expectation of the input costs required to achieve the opex objectives. We have removed these other debt raising costs from Energex's benchmark rate of debt raising costs.

To assess the reasonableness of Energex's proposed total opex forecast, we updated its estimate using our standard approach. We then included this updated estimate in our alternative estimate of total opex.[1859] Because Energex's proposal total opex forecast was similar to our alternative AER total opex estimate, our preliminary decision is to accept Energex's proposal total opex forecast. This includes Energex's (distribution) debt raising cost forecast of $37.1 million.

Our updated estimate of the unit costs and components of TasNetworks' benchmark rate of debt raising transaction costs is set out in Table 3-67.

Table 3-67 Benchmark debt raising costs (basis points per annum)

Number of bonds	Value	1 bond issued	29 bonds issued
Amount raised		$250m	$7250m
Arrangement fee		6.92	0.02
Bond Master Program (per program)	$56,250	0.30	0.08
Issuer's legal counsel	$15,265	0.08	0.02
Company credit rating	$77,500	0.41	0.01
Annual surveillance fee	$35,500	0.14	0.70
Up-front issuance fee	5.20bp	0.69	0.01
Registration up-front (per program)	$20,850	0.11	0.31
Registration- annual	$7,825	0.31	0.02
Agents out-of-pockets	$3,000	0.02	8.2
Total (basis points per annum)		9.0	8.2

Source: AER, Incenta.

[1859] See section 7.3 of the operating expenditure attachment.

Other debt raising costs

As well as debt raising transaction costs, Ergon Energy proposed to apply two additional forms of debt raising costs included in the Incenta report.[1860] These were:

- liquidity costs—to establish and maintain bank facilities to meet S&P's liquidity requirements to maintain an investment grade credit rating
- three month ahead financing—to compensate for S&P's requirement that businesses re-finance their debt 3 months ahead of the maturity date of their existing debt.

We are not satisfied that either cost is necessary in order to compensate a service provider for the efficient costs of raising its debt. We have reached this conclusion because:

- The PTRM's timing assumptions already provide adequate compensation for the timing of revenue compared to expenses, to the extent that these cost streams are necessary. Therefore, there is no need for additional allowances to provide liquidity, or to compensate the service provider for the timing of its financing. This is because the PTRM implicitly provides a favourable allowance that exceeds these amounts.
- These proposed allowances result in a more complex regulatory approach to estimate debt raising costs given the modelling and data requirements to estimate these two additional categories.

Liquidity costs

We do not accept Energex's proposed liquidity costs.

In 2002, Allen Consulting Group (ACG) provided the ACCC with a report on working capital.1861 Working capital is one measure of a service provider's liquidity. It is calculated as current assets minus current liabilities. 'Current' refers to assets/liabilities that will be realised/settled within 12 months. Strictly, Energex's proposed allowance is designed to meet S&P's definition of liquidity as opposed to working capital.[1862] However, while S&P's definition of liquidity includes some additional items to that of the strict definition of working capital, the overall concept is the same—that is, that there be enough cashflow and liquid assets to meet short term liabilities over a 12 month period.

The report concluded that, because the PTRM assumes service providers receive revenue on the last day of the year, target revenue would offset any shortfall in the cost

[1860] ActewAGL, *Access arrangement information*, June 2014, p. 77.

[1861] ACG, *Working capital—Relevance for the Assessment of Reference Tariffs*, March 2002,

[1862] Incenta Economic Consulting, *Debt raising transaction costs–ActewAGL*, May 2014, p. 19

of financing operating expenditure (the required return on working capital). The report states:[1863]

> These results provide no rationale for including an additional allowance in target revenue to provide a return on working capital. Rather, the results suggest that, were further precision to be sought in relation to the within-year timing of cash-flow – which underpins the arguments for a return on working capital – then the likely outcome is that the more precise target revenue would be lower than that derived using the PTRM.

Further, ACG found that:[1864]

> The results above imply that [a working capital] allowance is unnecessary – while there may be a (small) financing cost associated with operating expenditure, any shortfall from not including an allowance in respect of working capital is likely to be swamped by the favourable allowance provided in respect of capital assets under the PTRM target revenue formula. It follows that if the Commission were to pursue further precision in relation to the assumptions it makes about the within-year timing of cash flow – which underpins the arguments for a return on working capital – then the likely outcome is that more precise target revenue would be lower than that derived using the PTRM.

ACG tested the magnitude of the favourable timing assumptions on a case study of a gas service provider. They found the timing assumptions in the PTRM provided a favourable 'bias' of 1.8 per cent of revenue compared to the revenue required to maintain adequate working capital.[1865]

In 2007, we identified that the PTRM has been modified since the 2002 ACG report to recognise capex in the middle of each year, while still assuming revenues are received on the last day of the year.[1866] In practice, this modification means that we add an additional half year of WACC to all capex in the year that it enters the capital base, in order to adjust for the time value of money. Service providers recover this incremental addition through increased depreciation and by increased return on capital while the capex is being depreciated. While strictly related to capex timing, this change further benefits the service provider and heightens the favourable cash-flow timing assumptions in the PTRM. This means that the level of the favourable 'bias' in the PTRM is in our view now greater than what was estimated by ACG in 2002. For these reasons we consider there is no need for an additional explicit allowance for liquidity costs, as service providers are already implicitly and sufficiently compensated for such costs.

[1863] ACG, *Working capital—Relevance for the Assessment of Reference Tariffs*, March 2002, p. 2.

[1864] ACG, *Working capital—Relevance for the Assessment of Reference Tariffs*, March 2002, p. 24.

[1865] ACG, *Working capital—Relevance for the Assessment of Reference Tariffs*, March 2002, p. 24.

[1866] AER, *Issues Paper, Guidelines, models and schemes for electricity distribution network service providers*, November 2007, p. 11.

As a result, we are not satisfied that Energex's proposed liquidity costs contribute to a realistic expectation of the input costs required to achieve the opex objectives.

Three month ahead financing

We do not accept Energex's proposed costs for three months ahead financing. As with liquidity costs, and considering its low materiality (approximately five basis points per annum), we consider it is likely that an additional allowance for these costs is unnecessary due to the revenue impact of the favourable timing assumptions in in the PTRM.

Overall, we are not satisfied that Energex's proposed allowance for three month ahead financing contributes to a realistic expectation of the input costs required to achieve the opex objectives.

K Equity and debt averaging periods (confidential)