Draft decision

Jemena Gas Networks (NSW) Ltd

Access arrangement 2015–20

Attachment 3: Rate of return

November 2014

© Commonwealth of Australia 2014

This work is copyright. In addition to any use permitted under the Copyright Act 1968, all material contained within this work is provided under a Creative Commons Attribution 3.0 Australia licence, with the exception of:

- the Commonwealth Coat of Arms
- the ACCC and AER logos
- any illustration, diagram, photograph or graphic over which the Australian Competition and Consumer Commission does not hold copyright, but which may be part of or contained within this publication.

The details of the relevant licence conditions are available on the Creative Commons website, as is the full legal code for the CC BY 3.0 AU licence.

Requests and inquiries concerning reproduction and rights should be addressed to the Director, Corporate Communications, ACCC, GPO Box 3131, Canberra ACT 2601, or publishing.unit@accc.gov.au.

Inquiries about this document should be addressed to:

Australian Energy Regulator
GPO Box 520
Melbourne Vic 3001
Tel: (03) 9290 1444
Fax: (03) 9290 1457
Email: AERInquiry@aer.gov.au

AER reference: 51741

Note

This attachment forms part of the AER's draft decision on Jemena Gas Networks 2015–20 access arrangement. It should be read with other parts of the draft decision.

The draft decision includes the following documents:

Overview

Attachment 1 – services covered by the access arrangement

Attachment 2 – capital base

Attachment 3 – rate of return

Attachment 4 – value of imputation credits

Attachment 5 – regulatory depreciation

Attachment 6 – capital expenditure

Attachment 7 – operating expenditure

Attachment 8 – corporate income tax

Attachment 9 – efficiency carryover mechanism

Attachment 10 – reference tariff setting

Attachment 11 – reference tariff variation mechanism

Attachment 12 – non-tariff components

Attachment 13 – demand

Contents

Shortened forms

Shortened form	Extended form
2010–15 access arrangement	Access arrangement for JGN effective from 1 July 2010 to 30 June 2015 inclusive
2010–15 access arrangement period	1 July 2010 to 30 June 2015 inclusive
2015–20 access arrangement	Access arrangement for JGN effective from 1 July 2015 to 30 June 2020 inclusive
2015–20 access arrangement period	1 July 2015 to 30 June 2020 inclusive
Access arrangement information	Jemena Gas Networks (NSW) Ltd, *Access Arrangement Information 2015–20*, 30 June 2014
Access arrangement proposal	Jemena Gas Networks (NSW) Ltd, *Access arrangement, JGN's NSW gas distribution networks, 1 July 2015 – 30 June 2020*, 30 June 2014
AER	Australian Energy Regulator
capex	capital expenditure
CAPM	capital asset pricing model
CCP	Consumer Challenge Panel
Code	National Third Party Access Code for Natural Gas Pipeline Systems
CPI	consumer price index
DRP	debt risk premium
ERP	equity risk premium
JGN	Jemena Gas Networks (NSW) Ltd (CAN 003 004 322)
MRP	market risk premium
NGL	national gas law
NGO	national gas objective
NGR	national gas rules

Shortened form	Extended form
opex	operating expenditure
PPI	partial performance indicators
PTRM	post-tax revenue model
RAB	regulatory asset base
RBA	Reserve Bank of Australia
Reference service agreement proposal	Jemena Gas Networks (NSW) Ltd, *Reference Service Agreement, JGN's NSW gas distribution networks*, 30 June 2014
RFM	roll forward model
RIN	regulatory information notice
RPP	revenue and pricing principles
SLCAPM	Sharpe-Lintner capital asset pricing model
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 capital base.[1] The rate of return is discussed in this attachment.

3.1 Draft decision

We are satisfied that the allowed rate of return of 6.80 per cent (nominal vanilla) we determined, subject to updating achieves the allowed rate of return objective.[2] That is, we are satisfied that the allowed rate of return is commensurate with the efficient financing cost of a benchmark efficient entity with a similar degree of risk as that which applies to Jemena Gas Networks NSW (JGN) in providing reference services.[3] We are satisfied that this allowed rate of return reflects the overall efficient financing costs of the benchmark efficient entity with a similar degree of risk as JGN because:

- It is a weighted average of the estimated efficient debt and equity financing costs of the benchmark efficient entity operating with a capital structure of 60 per cent debt and 40 per cent equity.[4]
- The estimation of the efficient debt and equity financing costs were undertaken using market data consistently to determine the efficient gearing ratio and the equity beta at the efficient gearing ratio The market data used to estimate the efficient financing costs is reflective of the compensable risks that would face capital providers to an efficient benchmark entity with a similar degree of risk as JGN.

We are not satisfied that JGN's proposed (indicative) 8.67 per cent rate of return is such that it achieves the allowed rate of return objective.[5] We are also not satisfied that JGN has met the requirement to propose an estimate on a reasonable basis which is the best forecast or estimate possible in the circumstances.[6]

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.[7] 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 Gas Objective (NGO).[8]

The allowed rate of return of 6.80 per cent will be updated annually. This is because our draft decision is to apply a trailing average portfolio approach to estimating debt which incorporates annual updating of the allowed return on debt.[9] Our return on equity estimate is set for the duration of the 2015–2020 period.

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

---

1 NGR, r. 87(1).
2 NGR, r. 87(2).
3 NGR, r. 87(3).
4 The estimation of the efficient debt financing costs at 60% debt gearing and the estimate of the efficient equity financing costs at 60% debt are discussed in the subsection–reasons for draft decision.
5 Jemena Gas Networks, Access arrangement information, June 2014, 93.
6 NGR, r. 74(2).
7 NGR, r. 87(4).
8 NGL, s. 28.
9 NGR, r. 87(9)(b).

- adopting a weighted average of the return on equity and return on debt (WACC) determined on a nominal vanilla basis (as required by the rules)
- adopting a 60 per cent gearing ratio
- a benchmark efficient entity would issue debt consistent with a term to maturity of 10 years
- approach to estimating the return on debt including the transition
- forecast inflation based on an average of the Reserve Bank of Australia's (RBA) short term inflation forecasts and the mid-point of the RBA's inflation targeting band.[10]

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

Our return on equity estimate is 8.1 per cent.[11] We derived this estimate by applying the Rate of Return guideline (the Guideline) approach referred to as the foundation model approach.[12] 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. JGN 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.[13] We do not agree with JGN that its proposal better meets the rule requirements and the NGO than the Guideline.[14] Our return on equity draft decision is largely consistent with the Guideline findings. The averaging period we will use to calculate the risk free rate for our return on equity estimate is set out in the confidential appendix.

We are satisfied that our draft decision on the return on debt is estimated such that the estimate for each regulatory year contributes to the achievement of the allowed rate of return objective.[15] Our estimation methodology results in the return on debt being or potentially being different for different regulatory years in the 2015–20 access arrangement period.[16] Our draft decision estimate for the first regulatory year is 5.93 per cent. We are not satisfied that JGN's proposed return on debt estimation procedure better achieves the allowed rate of return objective.

Our draft decision approach to estimating the return on debt which is consistent with the Guideline is as follows:[17]

- use a trailing average portfolio approach applied to the total return on debt—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
- update the return on debt estimate annually (that is, for each regulatory year)
- apply equal weights to all the elements of the trailing average

10 Jemena Gas Networks, *Access arrangement information*, June 2014, 92–98.
11 NGR, r. 87(3),(6) & (7).
12 AER, *Better regulation: Rate of Return Guideline,* December 2013.
13 NGR, r. 87(18).
14 Jemena Gas Networks, Access arrangement information, June 2014, pp.93–94.
15 NGR, r. 87(8).
16 NGR, r. 87(9)(b).
17 AER, *Better regulation: Rate of Return Guideline,* December 2013, section 6.

- implement transitional arrangements—in moving from the current 'on the day' approach to the new 'trailing averaging portfolio' approach—consistent with an annual re-pricing of a portion of the notional debt portfolio and a benchmark term of 10 years.[18]

Our draft decision implements this approach, by applying the following estimation procedure:

- adopts a 10 year term for the return on debt with a BBB+ credit rating
- applies a simple average of independent third party data from the Reserve Bank of Australia (RBA) and Bloomberg as follows:
  - the RBA broad BBB rated 10 year curve (the RBA curve)[19]—extrapolated to better reflect a 10 year estimate and interpolated to produce daily estimates
  - the Bloomberg broad BBB rated 7 year BVAL curve (the BVAL curve)[20]—extrapolated to 10 years
- the averaging periods that we will apply to estimate the prevailing return on debt for each regulatory year is set out in the rate of return confidential appendix.

Our estimation procedure set out in this draft decision is consistent with the Guideline. As foreshadowed in the Guideline we have now identified the independent third party data service provider and how we will apply the data.[21]

Our formula for automatically updating the trailing average portfolio return on debt annually is set out in the Return on Debt Appendix.[22]

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

Table 3-1 AER's draft decision on JGN's rate of return (nominal)

	2010–15 AER decision	2015–20 JGN's proposal	2015–20 AER draft decision
Nominal risk free rate (cost of equity)	5.85%	4.12%[(a)]	3.55%[(b)]
Equity risk premium	5.20%	6.59%[(c)]	4.55%
MRP	6.5%	N/A[(d)]	6.5%
Equity bet	0.8	N/A[(d)]	0.7
Gearing ratio	60.0%	60.0%	60.0%
Inflation forecast	2.60%	2.55%	2.55%

18 NGR, r. (87)(9)(b).
19 The RBA refers to this curve as 'Non-financial corporate BBB-rated bonds'.
20 The Bloomberg ticker for this curve is: BVCSAB07.
21 AER, *Better regulation: Rate of Return Guideline,* December 2013, section 6.3.3.
22 NGR, r. 87(12).

Nominal post–tax return on equity	11.05%	10.71%	8.1%
Nominal pre–tax return on debt	10.02%	7.30%	5.93%
Nominal vanilla WACC	10.43%	8.67%	6.80%

Source: AER analysis; Jemena Gas Networks, Access arrangement information, June 2014; Jemena Gas Networks, Access arrangement: JGN's NSW gas distribution networks 1 July 2010–30 June 2015, Amended by order of the Australian Competition Tribunal, June 2011.

(a) JGN proposed a multiple model approach as well as an alternative 'foundation model' approach, both of which result in the same return on equity estimate (10.71 per cent). Under the latter approach, JGN adopted a prevailing risk free rate of 4.12 per cent for input in the SLCAPM, based on a 20 business day averaging period ending 12 February 2014. The risk free rate is to be updated for the final decision. See: JGN, Access arrangement information, appendix 9.3: Return on equity proposal, June 2014, pp. 29, 41.

(b) This is a prevailing indicative risk free rate based on a 20 business day averaging period from 17 September to 15 October 2014. The risk free rate is to be updated for the final decision.

(c) Under its alternative 'foundation model' approach JGN adopted a risk free rate of 4.12 per cent, which implies an equity risk premium of 6.59 per cent (10.71 – 4.12 = 6.59). See: JGN, Access arrangement information, appendix 9.3: Return on equity proposal, June 2014, p. 41.

(d) JGN did not propose specific values for equity beta and MRP under its multiple model approach. However, under its alternative 'foundation model' approach it proposed a composite equity beta of 0.91 and an MRP of 7.21 per cent. See: JGN, Access arrangement information, appendix 9.3: Return on equity proposal, June 2014, pp. 40–41.

3.2 JGN's proposal

Return on equity

JGN proposed a return on equity estimate of 10.71 per cent.[23] It submitted that this estimate is based on an approach that has regard to all relevant models and evidence. Specifically, JGN's proposed return on equity estimate is a weighted average of the return on equity estimates produced from four financial models—the SLCAPM, Black CAPM, Fama–French three factor model, and SFG's construction of the DGM.[24]

In support of its proposal, JGN submitted expert reports from:

- SFG Consulting—*The required return on equity for regulated gas and electricity network businesses: Report for Jemena Gas Networks, ActewAGL distribution, Ergon and Transend,* 12 May 2014; *Cost of equity in the Black capital asset pricing model: Report for Jemena Gas Networks, ActewAGL, Networks NSW, Transend, Ergon and SA Power Networks*, 22 May 2014; *The Fama–French model*: *Report for Jemena Gas Networks, ActewAGL, Transend, TransGrid and SA Power Networks,*13 May 2014; *Alternative versions of the dividend discount models and the implied cost of equity: Report for Jemena Gas Networks, ActewAGL, APA, Ergon, Networks NSW, Transend and TransGrid,* 15 May 2015; *Equity beta: Report for Jemena Gas Networks, ActewAGL and Networks NSW*, 12 May 2014.

- Incenta Economic Consulting—*Update of evidence on the required return on equity from independent expert reports*, May 2014.

JGN submitted that the foundation model approach as set out in the Guideline gives undue weight to one model (the SLCAPM) and, if applied, could result in a downward biased return on equity

23 JGN, *Access arrangement information, Appendix 9.3: Return on equity proposal*, June 2014, pp. 28, 39.

24 The SLCAPM, Black CAPM, Fama–French three factor model and DGM were weighted 12.5%, 25%, 37.5% and 25% respectively. See: JGN, *Access arrangement information, Appendix 9.3: Return on equity proposal*, June 2014, p. 39.

estimate.[25] JGN submitted that if the foundation model is to be adopted, evidence from the four relevant financial models should be incorporated into the equity beta estimate.

Return on debt

JGN proposed a return on debt estimate of 7.3 per cent, subject to updating, consistent with a ten year transition to the trailing average approach as set out in the Guideline.[26] JGN based this estimate on the yield curve published by the Reserve Bank of Australia (RBA), using a benchmark 10 year term and BBB credit rating. It submitted that a BBB credit rating recognises gas network service providers are inherently riskier than a combined gas/electricity benchmark.

JGN submitted that the return on debt should be estimated each year using the independent third party data source that best fits the traded bond data over the annual averaging periods.[27]

In support of its proposal, JGN submitted expert reports, including:

- Incenta Economic Consulting—*Methodology for extrapolating the debt risk premium*, June 2014.

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 Gas Rules (NGR). 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.[28] 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 is no one correct answer that achieves 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.[29] The AEMC specifically did not include in the new rules any preferred methods for determining the rate of return.[30] Instead it provided for the AER to exercise its judgement as to the best approach.[31]

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.[32] During the development of the Guideline, a group of investors and ENA again raised the importance of certainty.[33] In particular, the ENA noted that certainty and stability of outcomes in rate of return issues could materially benefit the long term interest of consumers.[34] We

---

25 JGN, *Access arrangement information, Appendix 9.3: Return on equity proposal*, June 2014, pp. 22–23, 40–41.
26 JGN, *Access arrangement information*, June 2014, pp. 93, 96–97.
27 JGN proposed this fit be measured statistically.
28 NGR, r. 87(2).
29 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).
30 See, for example, AEMC, *Final rule change determination*, 29 November 2012, p. iv.
31 AEMC, *Final rule change 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.
32 AEMC, *Final rule determination*, 29 November 2012, p. 50.
33 Financial Investors Group*, Submission on AER's equity beta issues paper*, 29 October 2013.
34 ENA, *Response to the Draft Rate of Return Guideline of the AER*, 11 October 2013, p.1.

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.[35] 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. 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."[36] 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."[37]

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.[38] This enables us to determine the estimate of the required rate of return at the time of each regulatory determination commensurate with the market at that time.[39] The rate of return framework incorporates a greater degree of regulatory judgement than did the previous framework.[40] 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.[41]

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.

JGN submitted a substantial 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.[42] Much of the material submitted by JGN is not new to us. Much of it was considered directly during the development of the Guideline and readdresses issues

35 NGR, r. 87(3).
36 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.
37 AEMC, *Final rule determination*, 29 November 2012, p.71.
38 NGR, r. 87(5) & (11).
39 NGR, r. 87(7).
40 NGR, r. 87(2) &(3).
41 NGR, r. 87(2) & (3).
42 Our consultants are listed in sub section 3.3.4.

that were before us at the time. Nevertheless, we have reviewed the material and our considerations are throughout this rate of return attachment and relevant appendices.

Although, this decision relates to only JGN, we are simultaneously considering a number of rate of return proposals from different NSPs.[43] TasNetworks did not propose any departures from the Guideline and applied it to determine its rate of return. The other NSPs proposed varying reasons, material and propositions to justify their proposed departures from the Guideline. We have had regard to the material in all of the different proposals in determining the return that meets the allowed rate of return objective. Our considerations are throughout this rate of return attachment and appendices.

We note that JGN has challenged a number of aspects of the Guideline approach (and methods) to estimating the return on equity and debt. In response, we have engaged with the material submitted, considered the reasons for the proposed departures and taken into account stakeholder submissions. In doing so, we have undertaken two interdependent tasks as required by 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).[44] The WACC formulae is:

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

[43] ActewAGL, Ausgrid, Endeavour Energy, Essential Energy, TasNetworks (accepted the Guideline), TransGrid and Directlink.

[44] NGR, r. 87(4).

- $\frac{E}{V}$ 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:[45]

- 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

- 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:[46]

> …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 gas 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 gas objective.[47] The rate of return is a part of an access arrangement decision which is an AER economic regulatory function or power. The national gas objective states:

> The objective of this Law is to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of electricity with respect to price, quality, safety, reliability and security of supply of natural gas.

In addition, we take into account the revenue and pricing principles when exercising discretion in making an access arrangement relating to reference tariffs.[48] 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.[49]

- 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.[50]

---

45 NGR, r. 87(5).
46 NGR, r. 87(3).
47 NGL, s. 28(1)(a).
48 NGL, s. 28(2).
49 NGL, s. 24(2).
50 NGL, s. 24(3).

- A price or charge should allow for a return that matches the regulatory and commercial risks from providing the regulated service that charge relates.[51]
- 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.[52]
- 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.[53]

Return on equity

Our return on equity for a access arrangement 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.[54]

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.[55]

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 access arrangement period.[56]

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 access arrangement period, including as to the timing of capital expenditure
- any impacts (including in relation to the costs of servicing debt across access arrangement 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 access arrangement period to the next.[57]

Make and publish the rate of return guideline

On 17 December 2013, [58] as required under the rules, we published the Guideline which is available on our website. [59] Within it we specified:[60]

---

51 NGL, s. 24(5).
52 NGL, s. 24(6).
53 NGL, s. 24(7).
54 NGR, r. 87(6) & (7).
55 NGR, r. 87(8).
56 NGR, r.87(8).
57 NGR, r.87(11).
58 http://www.aer.gov.au/node/18859
59 NGR, r. 87(13).
60 NGR, r. 87(14).

- 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.[61] Network businesses must provide reasons in their revenue proposals for any proposed departures from the Guideline.[62] Should we decide to depart from the Guideline in a transmission determination then we must provide reasons for any such departures.[63]

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 section.[64] 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 extensive 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:[65]

- 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

61 NGR, r. 87(14)(b).
62 NGR, r. 72(g).
63 NGR, r. 87(3).
64 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 .
65 See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013, pp. 19–20.

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 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 receive 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.[66]

- 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.

---

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

- 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 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.[67]

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 the objectives. 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.[68]

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 efficient rate of return for the benchmark entity. For example, some information may be more relevant, more feasible to construct, or more reliable than others. We do not accept JGN's submission that the criteria results in our approach not being focussed on achieving the allowed rate of return objective.[69] We considered that our decisions on the rate of return are more likely to achieve 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

---

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

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

69 Jemena Gas Networks, Access arrangement information, June 2014, appendix 9.3, pp.21–22.

(3) implemented in accordance with good practice

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

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

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

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

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

(a) credible and verifiable

(b) comparable and timely

(c) clearly sourced

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

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 the benchmark efficient entity is to:

- adopt a single benchmark across gas, electricity, transmission and distribution
- adopt a conceptual definition of the 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.[70] Our benchmark efficient entity includes the following sub components as defined below:[71]

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

70 NGR, r. 87(3).
71 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.

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.

Operating within Australia

The 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.[72]

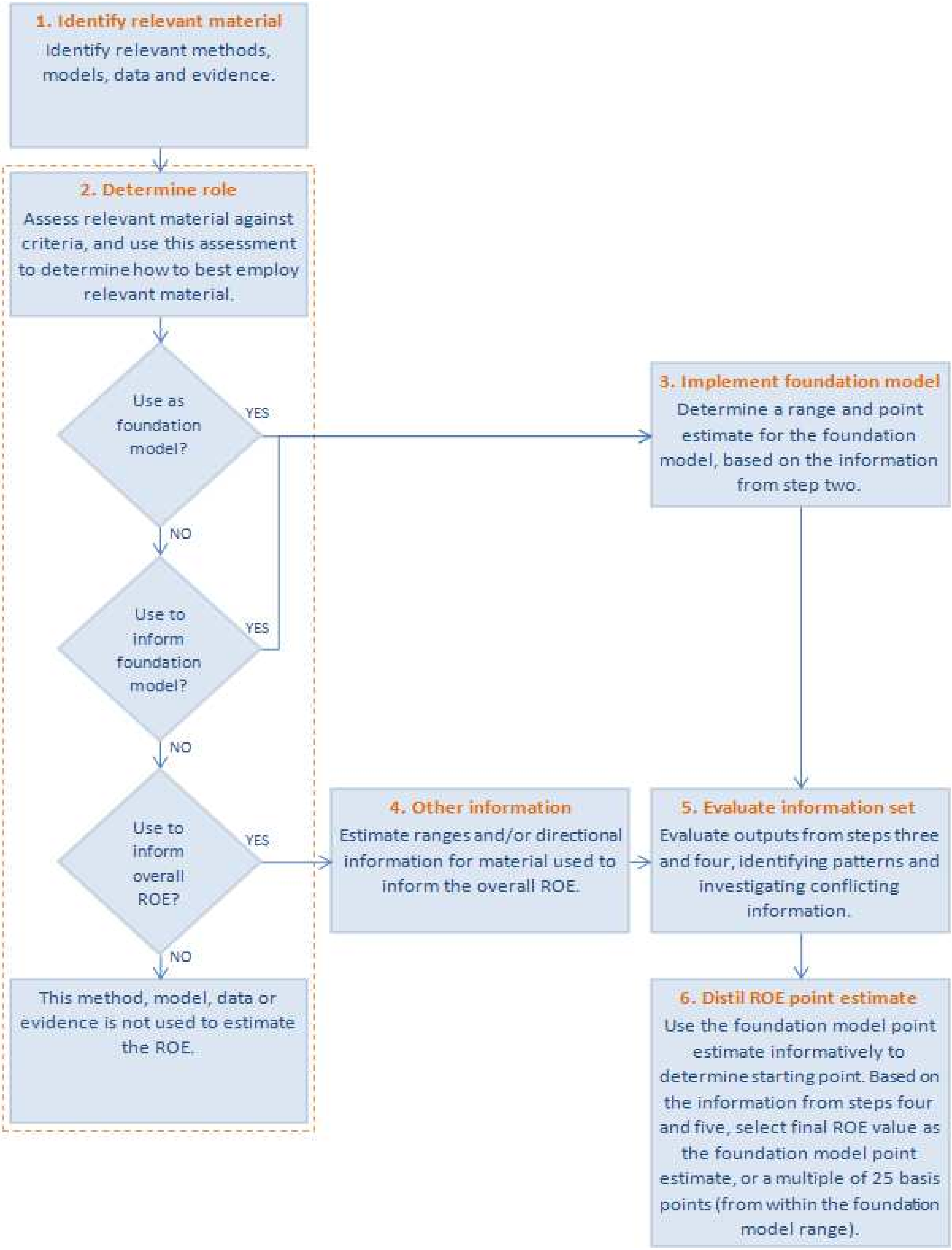
Return on equity

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.[73]

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

73 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 draft 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 access arrangement 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 draft 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[74]

The above positions are consistent with the return on debt approach and implementation we proposed in the rate of return guideline (the Guideline).[75] Accordingly, our draft decision is to maintain the return on debt methodology we proposed in the Guideline.

In the Guideline, we proposed to use one or more third party data series to estimate of the return on debt.[76] 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 draft decision is to use a simple average of:

- the RBA broad-BBB rated 10 year curve (the RBA curve),[77] 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[78]

Further, our draft 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 JGN's averaging periods.[79]

---

74 AER, *Rate of return guideline*, December 2013, pp.21-22; AER, *Explanatory statement—Rate of return guideline*, December 2013, p.126.

75 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.

76 AER, *Explanatory statement—Rate of return guideline*, December 2013, pp. 23–24.

77 The RBA refers to this curve as 'Non-financial corporate BBB-rated bonds'.

78 The Bloomberg ticker for this curve is: BVCSAB07.

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.[80] 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.[81] We recently published our proposed amendments to the transmission and distribution post tax revenue model (PTRM) to enable the application of the guideline changes.[82]

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 WACC. Where we have had regard to these in developing our approach, they are more fully described in the Guideline. The manner in 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 an efficient benchmark 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.[83] 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 risks. This provides a reasonable opportunity to recover at least the efficient costs.[84] 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.[85]

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. These interrelationships between the types of risk and the

---

79 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.

80 NGR, r. 87(9).

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

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

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

84 NGL, s. 24(2).

85 NGL, s. 24(3).

required compensation via the rate of return are an important factor.[86] 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).

Domestic market

We adopt the Australian market as the market within which the benchmark efficient entity operates in. 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 are most likely to give most reliance to Australian market data whilst, using overseas data informatively.

Benchmark gearing

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

- to weight the 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.[87]

Term of the rate of return

We adopt a 10 year term for our overall rate of return.[88] 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

---

86 See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013, ch.3.3
87 See, *Better Regulation, Draft Rate of Return Guideline, Explanatory statement*, August 2013, ch.8.34 and appendix C.
88 See AER, *Better regulation: Explanatory statement rate of return guideline,* December 2013, ch.4.3.4.

- The market risk premium (MRP) estimate is for a 10 year forward looking period
- We adopt a 10 year debt term for estimating the return on debt.

3.3.4 Expert reports and stakeholder submissions

Expert reports

We commissioned expert advice from the following finance experts to assist us in making this draft decision:

- Professor Michael McKenzie, University of Liverpool.[89]
- Associate professor Graham Partington, University of Sydney.[90]
- Associate professor John Handley, University of Melbourne.[91]
- Associate professor Martin Lally, Victoria University of Wellington.[92]

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.[93] We also received advice on return on debt estimation from the ACCC Regulatory Economic Unit (REU).[94] 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 draft decision.[95]

Stakeholder submissions

We received a large number of submissions which are listed in the overview attachment appendix. Most of the submissions had commentary relating to the rate of return.

3.4 Reasons for draft 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.[96] In deriving the WACC, and the estimated efficient debt and equity financing costs, we have applied the benchmark efficient entity gearing ratio of 0.6 (debt):0.4 (equity) that we proposed in the Guideline. We have no reason to depart from this gearing ratio.[97]

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.

Subsection 3.4.4 sets out our expected inflation rate for the 2015–20 access arrangement period.

---

89 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.

90 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

91 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

92 Martin Lally, *Transitional arrangements for the cost of debt*, November 2014; and Martin Lally, *Implementation issues for the cost of debt*, November 2014.

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

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

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

96 NGR, r. 87(4).

97 All the NSPs whose regulatory proposals we are currently assessing have proposed a gearing ratio consistent with the Guideline.

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. We had regard to more than 5000 pages of material submitted with this revenue proposal.[98] 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 on a particular issue, our considerations in the guideline are relevant to this decision.[99]

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 of our key conclusions

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 parameters or as other information — other than as the foundation model, to inform our return on equity estimate.[100]

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. Applying this model, would lead to an expected return on equity that contributes to achieving the allowed rate of return objective. We consider it superior to other models we have considered. We therefore employ the SLCAPM as our foundation model.

We are not satisfied that other equity models submitted to us as well as proposed application of quantitative and qualitative methods to giving weight to these models better achieves the allowed rate of return objective.[101] 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

[98] See relevant material appendix for more details about the volume of information.

[99] 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 .

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

[101] We are concurrently assessing regulatory proposals from eight different NSPs and their different adaptations are also taken into account.

equity commensurate with the risks of a benchmark efficient entity in providing regulated network services and achieving the allowed rate of return objective.[102]

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 CAPM 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.

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 achieving 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 contribute to achieving the allowed rate of return objective.[103] The following evidence plays a role in estimating the MRP: historical excess returns, DGM estimates, 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.[104] Estimates of the MRP are diverse and vary over time.[105] We do not agree with Jemena Gas Networks that the MRP should be estimated with the most reliance placed on DGM based estimates with lesser reliance placed on historical excess returns.[106] We also do not consider material reliance should be place on estimates from historical excess returns (the Wright approach) or from independent expert valuation reports.[107] In relation to DGM based estimates, even if we considered more reliance should be placed on them, we do not consider SFG's proposed construction of the DGM is sufficiently robust in the context of our task.[108]

The equity beta for our benchmark efficient entity is also estimated using a number of different pieces of information. We have defined the 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. International empirical estimates and the theory of the Black CAPM also provide an informative role.

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) and return on debt as directional information.

---

102 John Handley, *Advice on return on equity, Report prepared for the AER*, 16 October 2014, p.5..

103 NGR, r. 87(7).

104 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'.

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

106 SFG, *The required return on equity for regulated gas and electricity network businesses*, June 2014, p. 8.

107 SFG, *The required return on equity for regulated gas and electricity network businesses*, June 2014, p. 8.

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

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.

Risk free rate

We have used an indicative risk free rate of 3.55 per cent in this draft decision.[109] We are satisfied the risk free rate we apply provides for a return on equity that contributes to the achievement of the allowed rate of return objective.[110] That is, it is a forward looking risk free rate commensurate with prevailing conditions in the market for funds at the commencement of the regulatory control period.[111] As such, this risk free rate also has regard to the prevailing conditions in the market for equity funds, as the rules require.[112] For the final decision we will update this risk free rate using the period that JGN proposed to us.[113] We accept this proposal because we consider JGN based this period on 20 consecutive business days as close as practicably possible to the commencement of the regulatory period.[114]

MRP

Our point estimate of the MRP for this draft decision is 6.5 per cent. We consider a range of 5.1 to 7.8 per cent is reasonable for the MRP under current market conditions, based on the material before us to inform our decision. The geometric mean of historical excess returns currently provides the lowest estimate of the MRP with a range of 4.0 to 4.9 per cent. We consider a reasonable estimate of the lower bound will be above the geometric average.[115] Therefore, our lower bound is above this range. The DGM currently provides the highest estimate of the MRP at about 7.8 per cent.[116] We apply this as the upper bound for the range.

We derive our point estimate from within this range by considering all of the information that we determine should play a role. Together, this information indicates that 6.5 per cent reasonably reflects prevailing conditions in the market for equity funds and contributes to achieving the allowed rate of return objective.[117] JGN proposed an MRP of 7.21 per cent (implied by a return on the market of 11.33 per cent), based on historical excess returns, the Wright approach, SFG's DGM and independent valuation reports.[118] We consider this does not lead to a return on equity that contributes to achieving the allowed rate of return objective. Figure 3-2 shows the 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.

---

109 We base this on an indicative averaging period of 17 September 2014 to 15 October 2014.

110 NGR, r. 87(6).

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

112 NGR, r. 87(7).

113 JGN, *Access arrangement information: Appendix 9.2 averaging period proposal*, 30 June 2014, p. 1 (confidential).

114 For clarity, service providers can select longer periods for estimating the risk free rate used in the return on debt.

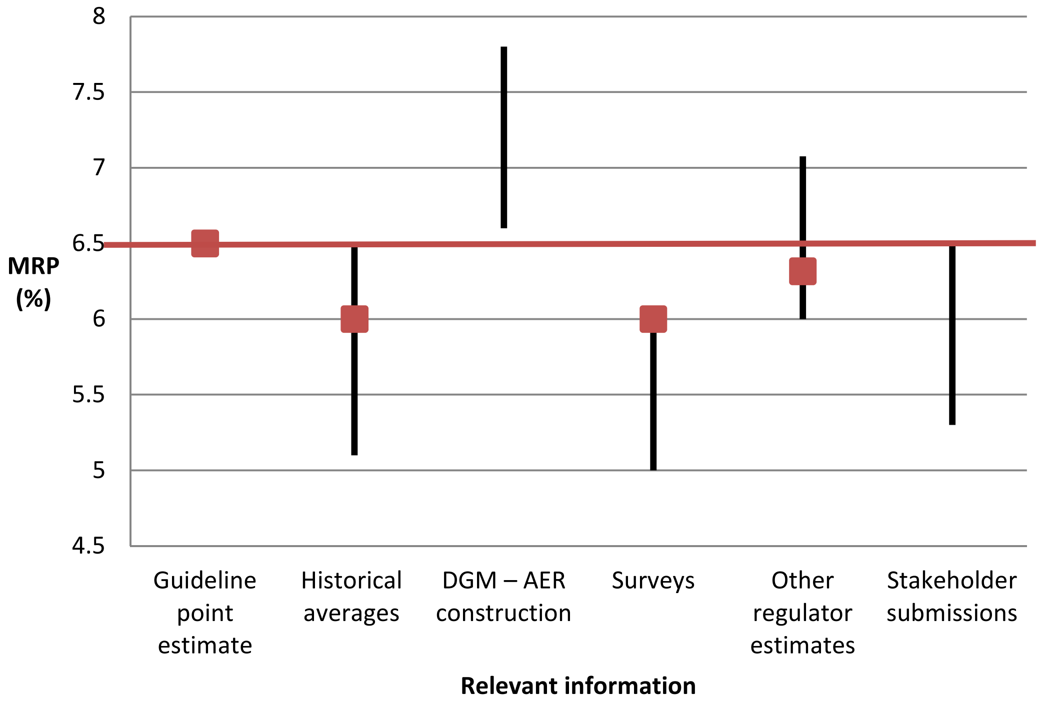
115 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p.83; AER, *Draft decision: SPI Networks access arrangemen*t, September 2012, Appendix B.2.1.

116 This is a conservatively high estimate using our construction of the DGM because we derive this using the upper bound of our long term dividend growth rate assumptions. The averaging period for this estimate is August–September 2014.

117 NGR, r. 87(6).

118 JGN, *2015–20 Access arrangement information, Appendix 9.3 return on equity proposal*, 5 June 2014, p. 31.

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



Source: AER analysis

Note: The average of each state regulator's most recent decision on the MRP is 6.3 per cent. In July 2014, IPART applied an effective MRP of 7.1 per cent, which forms the top of our range. The bottom of this range is 6.0 per cent — the latest estimates the ESCV, ESCOSA and QCA applied.[119]

The bottom and top of the stakeholder range comes from UnitingCare Australia and Origin respectively. The top also comes from submissions that support applying values consistent with the guideline, like EMRF.[120]

Equity beta

Our point estimate of the equity beta for this draft 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 2014 report, and the empirical estimates from this analysis are consistent with a range of 0.4 to 0.7.[121] We consider the latest empirical study by Professor Olan Henry to be robust and taken together with previous studies give us confidence to place 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 appendix D.3) and the theoretical underpinnings of the Black CAPM. This other information does not specifically indicate an equity beta at the very top of our range. However, for reasons discussed in appendix D.5.2, we consider a point estimate of 0.7 is reasonably consistent with these sources of information

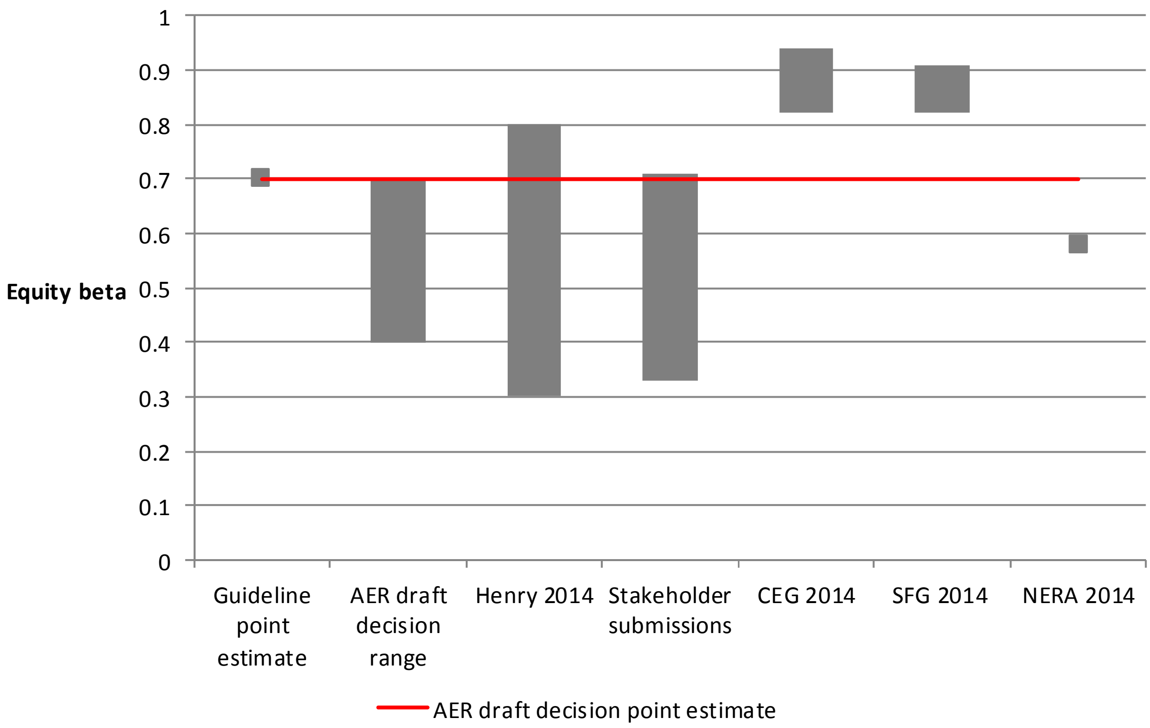
119 IPART, *NSW rail access undertaking review of the rate of return and remaining mine life— Transport final report and decision*, July 2014, p. 13; ERA, *Determination on the 2013 WACC for the freight and urban railway networks*, July 2013; ESC, *Price review 2013: Greater metropolitan water businesses - Final decision*, June 2013; ESCOSA, *SA Water's water and sewerage revenues 2013/14-2015/16: Final determination - Statement of reasons*, May 2013.

120 UnitingCare Australia, *Submission to the AER*, 3 September 2014, p. 19; Origin, *Submission to ActewAGL's regulatory proposal*, 20 August 2014, p. 4; EMRF, *Submission on TransGrid's revenue proposal 2014–2019*, 8 August 2014, p. 8.

121 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.

and is a modest step down from our previous regulatory determinations.[122] 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. Some users have submitted that we should choose an equity beta lower than 0.7. However, the importance that all stakeholders place on certainty and predictability suggest to us that a departure from the guideline is unlikely to better achieve the allowed rate of return objective at this time.[123] Figure 3-3 shows our equity beta point estimate and range for the benchmark efficient entity compared to other submissions.

Figure 3-3 Comparison of the AER's equity beta range and point estimate with Henry's 2014 report and submissions



Source: AER analysis[124]

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 Norske Skog Paper Mills' submission that we should adopt the median estimate presented in Henry's 2014 report. The upper bound is based on Origin's submission that we should not increase the equity beta above 0.71. The CEG 2014 range lower bound is equal to the SFG 2014 lower bound and its upper bound is based on DGM estimates. The SFG 2014 range lower bound is based on SFG's regression analysis of Australian and US firms and the upper bound is based on SFG's composite equity beta estimate proposed under its alternative 'foundation model' approach. The NERA 2014 point estimate is based on an equity beta of 0.58, which NERA used for its preferred specification of the SLCAPM.

Step four: other information

---

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

123 See section 'Step three: implementing the foundation model'.

124 Based on our draft decision and the following reports: AER, *Rate of return guideline*, December 2013, p. 15; Henry, *Estimating β: An update*, April 2014, p. 63; Norske Skog Paper Mills, *Submission to TransGrid's revenue proposal for 2014–19*, August 2014, p. 8; Origin, *Submission to ActewAGL's regulatory proposal for 2014–19*, August 2014, p. 4; CEG, *WACC estimates: A report for the NSW DNSPs*, May 2014, p. 7; NERA, *Return on capital of a regulated electricity network*, May 2014, p. 79. SFG proposes 0.82 in SFG, *Equity beta*, May 2014, p. 41 and 0.91 in SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 11.

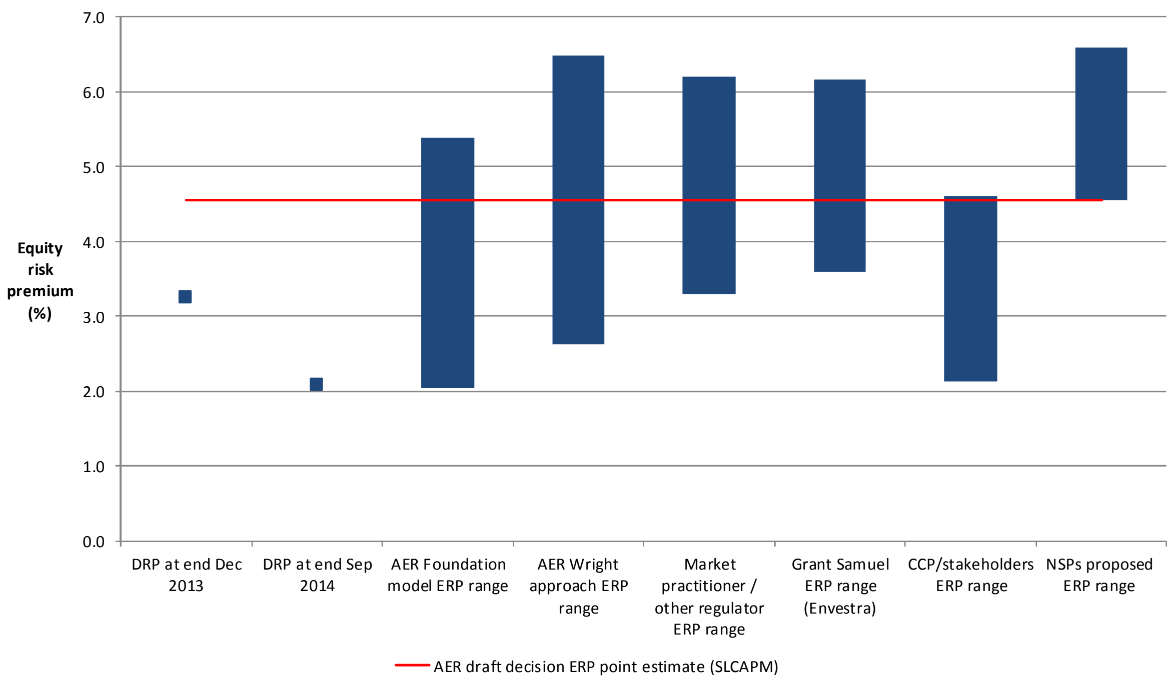
Under step one and two we considered other information and determined its role. Under step four we estimate the values we derive from other information. We consider that, on the whole, this other information broadly supports our foundation model estimate of the return on equity. The critical allowance for an equity investor in a benchmark efficient entity is the allowed equity risk premium (ERP) over and above the estimated risk free rate at a given time.[125] Under the standard application of the SLCAPM, this equals the MRP multiplied by the equity beta. Hence, we have compared ERP estimates where relevant. Our analysis shows that:

- The Wright approach to specifying the CAPM results in an ERP range of 2.6 to 6.5 per cent. This equates to a return on equity range of 6.2 to 10.1 per cent with a prevailing risk free rate.
- ERP estimates from other market participants (independent valuers, brokers, and other regulators) for comparable firms range from 3.3 to 6.2 per cent. This equates to a return on equity range of 6.9 to 9.8 per cent with the prevailing risk free rate.
- Our foundation model return on equity estimate is about 2.5 per cent above the prevailing return on debt. This reflects the difference between our ERP of 4.55 per cent and the debt risk premium (DRP) on 10 year BBB bonds of approximately 2.08 per cent.[126]

Step 5: Evaluation of information set

Adopting our input parameter point estimates results in an allowed equity risk premium (ERP) 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 ERP



125 Our task is to determine the efficient financing costs commensurate with the risk of providing regulated gas pipeline services 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).

126 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 September 2014).

Source: AER analysis and various submissions and reports.

Notes: The AER's foundation model ERP range uses our draft decision equity beta range of 0.4 to 0.7 and MRP range of 5.1 to 7.8 per cent. The AER's foundation model point estimate uses our draft decision equity beta point estimate of 0.7 and MRP point estimate of 6.5 per cent.

The debt risk premiums (DRPs) are based on RBA data on the yield to maturity for BBB-rated non-financial corporate bonds with a 10 year term, specifically, the spread to 10 year CGS. These are not reflective of our draft decision return on debt estimate which is calculated as an average of the RBA and Bloomberg (BVAL) data series. We have also made an extrapolation adjustment to the RBA data series.

The Wright approach range is based on an equity beta range of 0.4 to 0.7; a return on the market range of 10.1 to 12.8 per cent; and a risk free rate of 3.55 per cent.

The other market practitioner ERP range is based on the range of return on equity (and ERP) estimates presented in the valuation reports, broker reports and other regulators' decisions we have considered. When ranges are presented in these reports, the full range is considered instead of taking the mid–point of the range.

Grant Samuel applied an uplift to its final WACC estimate for Envestra and it is difficult to determine how much of the uplift is attributable to the return on equity. Grant Samuel also did not include a gamma adjustment for the MRP. Therefore, the lower bound of the Grant Samuel ERP range is its initial lower bound return on equity estimate (no uplift, no gamma adjustment). The upper bound of the Grant Samuel ERP range is based on its initial upper bound return on equity estimate. The entire WACC uplift is applied to this return on equity estimate and we applied a gamma uplift. The upper bound of the Grant Samuel ERP range shows the most extreme case (where the entire WACC uplift is attributed to return on equity). See: Grant Samuel, *Envestra: Financial services guide and independent expert's report*, March 2014, Appendix 3.

The CCP/stakeholder ERP range is based on the CCP's advice and stakeholder submissions we received (not including service providers). The lower bound is based on UnitingCare's submissions. UnitingCare proposed an equity beta of 0.4 and MRP of 5.3 per cent (at the low end of the Guideline ranges). The upper bound is based on Origin's submission on ActewAGL's proposal. Origin proposed maximum estimates of 0.71 for the equity beta and 6.5 per cent for the MRP. See: UnitingCare, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, September 2014, pp. 19–20; UnitingCare, *Submission to ActewAGL's regulatory proposal for 2014–19*, September 2014, pp. 19–20; Origin Energy, *Submission to ActewAGL's regulatory proposal for 2014–19,* August 2014, p. 4.

The NSPs' ERP range incorporates the different approaches proposed by the NSPs. The lower bound is based on TasNetworks' proposal, which adopts the Guideline return on equity approach and parameter values. The upper bound is based on ActewAGL's and JGN's proposals, which derive the same return on equity estimate (10.71 per cent) from two alternative approaches (multiple model approach and alternative 'foundation model' approach). We calculate the ERP by subtracting their prevailing risk free rate from their return on equity estimate (10.71 – 4.12 = 6.59). See: TasNetworks, *Revenue proposal*, May 2014, p. 108; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 10–11.

In coming to this conclusion the key influential factors are:

- Since we published the Guideline, we received Professor Olan Henry's 2014 report on empirical equity beta estimates based on Australian energy network firms.[127] Some users consider the evidence from this report suggests we should adopt an equity beta point estimate below 0.7.[128] There are also some movements in the historical excess returns on the market and the MRP estimates derived by applying our DGM. We recognise that these movements do represent slight changes to information relevant to the current market conditions. Having considered the overall information and material before us, at this time we are not satisfied that this new information indicates a departure from the Guideline better achieves the allowed rate of return objective. We think the importance placed by all stakeholders on predictability and certainty of the Guideline is important to achieving the allowed rate of return objective.

- 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.[129] 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 decisions, albeit marginally lower. This provides confidence that our estimate for this draft decision, whilst taking account of better

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

[128] For example, see: UnitingCare, *Submission to ActewAGL's regulatory proposal for 2014–19*, September 2014, p. 20. More examples can be found in our discussion on equity beta in Step 3.

[129] Since 2008, the TNSPs and DNSPs across the NEM have invested about $6.0 billion per year in capex This is a high level conservative estimate..

information on the equity beta and current market conditions is likely to provide the NSPs a reasonable opportunity to recover the least efficient costs.[130]

- Our foundation model return on equity estimate is about 2.5 per cent 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 JGN, 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.[131] The return on debt material does not support any change to our foundation model return on equity estimate.

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 ERP estimate should be uplifted or downshifted to better achieve 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 8.1 per cent derived from our implementation of the SLCAPM will contribute to achieving the allowed rate of return objective. We are also satisfied that this estimate is consistent with prevailing market conditions.

From here onward we discuss our decision in more detail under each step of our estimation process.

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 consider all models submitted before us are relevant information.[132] This is consistent with our approach at the time of publication of the Guideline. We have had regard to the information on the different models before us at the time of the Guideline, the information contained in the Guideline and associated Explanatory Statement and Appendices to the Explanatory Statement, and new information on these models submitted that was not available at the time of the Guideline.

[130] In using an equity beta of 0.7 and an MRP of 6.5 per cent, we have reduced the allowed ERP by 0.25 per cent relative to our recent regulatory decisions. Compared with the AER's previous decision for JGN, the allowed ERP is lower by 0.65 per cent. The previous decision adopted an MRP of 6.5 per cent and equity beta of 0.8.

[131] 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 step 2 discussion.

[132] NGR, r.87(5).

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 approach and historically based) SLCAPMs.

The assessment of the models against our assessment criteria is discussed as part of assessing their role in step 2.

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 reliable 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 AER criteria

Criteria[133]	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.[134]
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. We should also promote simple over complex approaches where appropriate.	Prevailing 10 year CGS yields reflect expectations of the risk free rate over the 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).[135]
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.[136]
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.

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

134 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.

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

136 RBA, *Letter to the ACCC: The Commonwealth Government Securities Market*, 16 July 2012; Australian Treasury and AOFM, *Letter to the ACCC: The Commonwealth Government Securities Market*, 18 July 2012, p. 2.

MRP

Recognising that 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.[137] This evidence comes from historical excess returns, DGM estimates, survey evidence and conditioning variables. We also have regard to recent decisions by Australian regulators.[138]

We use a DGM adjusted for the value of imputation credits 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.[139] 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).[140]
- We must assess a range of evidence and apply judgement to determine a point estimate because estimates of the MRP are diverse and vary over time.[141] 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.[142]
- Considering a range of information is consistent with the approach used by finance market practitioners.[143]

JGN proposed an MRP based on a report from SFG.[144] SFG based its estimate on historical excess returns, the Wright approach, SFG's construction of the DGM and independent expert reports.

We agree with the following aspects of this approach:

- using historical excess returns to estimate the MRP
- using DGMs to estimate the MRP

---

137 NGR, r. 87(7).

138 AER, *Rate of return guideline*, 17 December 2013, p. 16.

139 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'.

140 AER, *Explanatory statement rate of return guideline*, 17 December 2013, pp. 90–91.

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

142 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'.

143 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.

144 JGN, *2015–20 Access arrangement information, Appendix 9.3 return on equity proposal*, 5 June 2014, p. 31; SFG, *The required return on equity for regulated gas and electricity network businesses*, June 2014, p. 80.

- using a range of material to estimate the MRP.

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.[145] 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. In determining how we use the Wright approach, we have regard to its merits and limitations by assessing it against the criteria (see table 3-10).

- Using independent valuation reports to estimate the MRP. We consider independent valuation reports and our estimate of the return on equity are most comparable at the overall return on equity level.[146] This recognises the tendency for the 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.[147] In determining how we use this information, we have regard to its merits and limitations by assessing it against the criteria (see table 3-16).

- Using SFG's construction of the DGM and its proposed imputation adjustment.[148] We consider our construction of the DGM is more suitable for regulatory purposes. We have had regard to these proposed alternatives in detail (see appendices B.6 and C). However, we consider our DGM construction and imputation adjustment preferable for estimating the MRP in the regulatory context.

- Disregarding survey evidence. We consider market surveys can be valuable and we should have some reliance on them (see table 3-3).

- Disregarding evidence from conditioning variables. We consider conditioning variables can be valuable and we should have some reliance on them (see table 3-3).

Only having regard to selective components of other regulator's approaches.[149] While considering other approaches can be useful, it is also valuable to analyse these decisions holistically by considering the final outcome (see Table 3-3). Table 3-3 summarises our assessment of information we use to estimate the MRP. In appendix B–MRP, we assess the information before us that we do not rely on to inform the MRP.

---

145 To see how we have regard to the Wright approach at the return on equity level, see Table 3-14.
146 To see how we have regard to the independent valuation reports at the return on equity level, see Table 3-14.
147 AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 28.
148 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014.
149 SFG, *The required return on equity for regulated gas and electricity network businesses*, June 2014, pp. 47, 64, 71.

Table 3-3 Assessment of information on the market risk premium against our 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.[150] There are challenges when selecting the averaging period and a measure of central tendency (arithmetic or geometric means)	DGMs reflect economic and finance principles. 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.	Lally has supported using survey evidence, but has warned some surveys warrant little consideration.[151]	Academic literature offers some conceptual basis for conditioning variables informing excess returns.[152] Some empirical evidence supports this too.[153] 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 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.	Fit for purpose because this is considered the benchmark method for estimating the MRP in Australia.[154] Historical excess returns can estimate a forward looking MRP on the view that investors base their forward looking expectations on past experience.[155]	Our DGM is relatively simple. However, DGMs are not widely used for estimating the MRP (or return on equity) in the Australian context.[156]	The MRP is a metric of investor expectations. Therefore, it is fit for purpose to estimate the MRP by asking investors what they expect.	There is a body of work which casts doubt on the accuracy of dividend yields as a predictor of excess returns, suggesting this is not fit for purpose.[157] Implied volatility may not provide any new information to what is already contained in DGM estimates.[158]	Derived for similar purposes. However, other regulators may operate under a different framework.

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

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

152 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.

153 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.

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

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

156 DGMs are not widely used in Australia. While IPART uses DGMs to inform its estimate of the MRP, it also considers historical excess returns. See IPART, *Review of WACC methodology: Research final report*, 9 December 2013, p. 2.

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

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

Criteria	Historical excess returns	Dividend growth models	Survey evidence	Conditioning variables	Regulatory decisions
Implemented in accordance with good practice. That is, supported by robust, transparent and replicable analysis that is derived from available credible datasets	Estimation methods and results are transparent, replicable, extensively studied and well understood. [159] 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.	The simplicity of our DGM enables it to be estimated in a robust, transparent and replicable manner.	Surveys can have significant limitations that can reduce the value of this information.[160] However, these limitations can be mitigated through the triangulation of survey evidence.[161]	Some evidence suggests the use of credit spreads is not robust for informing the MRP.[162] It is difficult to convert dividend yields and credit spread into an MRP estimate.[163] It is also difficult to apply implied volatility.[164]	Laws typically require regulatory decisions to be well reasoned and transparent.
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 errors in inputs estimation, b) avoids arbitrary filtering or adjustment of data, which does not have a sound rationale.	Not applicable.	DGM estimates are highly sensitive to changes in the interest rates. DGMs are also highly sensitive to assumptions.[165]	Not applicable.	Not applicable.	Not applicable

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

160 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.

161 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.

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

163 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.

164 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.

165 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
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.[166]	The dividend growth rate is difficult to estimate and materially affects the results. Other inputs are well sourced and verifiable, but evidence suggests analyst forecasts are overly optimistic.[167]	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 allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	Responds slowly to changes in market conditions.	Readily incorporates changes in the market data. However, DGMs may not track these changes accurately.[168] DGMs can also generate volatile and conflicting results.[169]	While results vary little across time, this likely reflects investor expectations as surveys are forward looking. However, survey results may not be timely.	Conditioning variables change daily, are readily observable and may offer information about changes in the MRP.	May not reflect prevailing market conditions, given delays from when decisions are made.

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

167 McKenzie, Partington, *The DGM*, December 2013, p. 8.

168 McKenzie, Partington, *Report to the AER, Part A: Return on Equity*, October 2014, p. 31.

169 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.

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.[170] The material that can potentially inform our decision 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.

We assessed this relevant material against the rate of return criteria. 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 appendix C sets out our assessment of the Fama French three factor model and SFG's DGM construction, respectively.

JGN proposed that we give international (primarily US) empirical estimates a determinative role in estimating equity beta for a benchmark efficient entity.[171] We consider such an approach would not be consistent with the merits of this information. 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.

---

170 NGR, r. 87(2)(7).

171 JGN, *Access arrangement information, Appendix 9.3: Return on equity proposal*, June 2014, p. 33. JGN'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 considered in the Guideline indicate an extension of our range. We consider these submissions demonstrate SFG's consideration that we should give international empirical estimates a determinative role in estimating equity beta. See: SFG, *Equity beta*, May 2014, pp. 4, 32.

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

Criterion	Conceptual analysis	Australian empirical estimates	International empirical estimates	Evidence from the Black CAPM
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 robust 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 approaches where appropriate.	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. Therefore, it is reasonable to use market data for domestic businesses that are considered to be close comparators to the benchmark efficient entity to inform the equity beta estimate.	International equity beta estimates do not meet the 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 than the Australian estimates.	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 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 he 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.[172]

172 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, pp20-241.

Criterion	Conceptual analysis	Australian empirical estimates	International empirical estimates	Evidence from the Black CAPM
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 errors in inputs estimation, b) avoids arbitrary filtering or adjustment of data, which does not have a sound rationale.	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.
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).

Other information

In addition to equity models and their parameters, we have had regard to the other information that our Guideline stated would be relevant material. We also have had regard to additional material that stakeholders submit should be treated as relevant. The Consumer Challenge Panel (CCP) submitted that we should have regard to information on realised returns from asset sales and NSP's financial statements.[173] 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 assessment criteria in step 2.

Step two: determine role

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

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

Equity models

We determined the role of the different equity models having regard to the information before us during the Guideline process and the new material submitted post this process (including information submitted in the NSPs proposals and submissions in relation to these proposals). We also received advice from our consultants on the roles for the various models. The roles of the relevant equity models are set out in Table 3-5.

We proposed to use several different models to inform our return on equity estimate when we published the Guideline. 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

[173] 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. 10–13.

foundation model; inform the estimation of the parameters of foundation model; inform our final return on equity point estimate; and not relied upon to estimate return on equity. The relevant models we considered for the purpose of determining our foundation model included the SLCAPM, the Black CAPM, the dividend growth model (DGM), the Fama French three factor model (FFM).[174] Thereafter, the guideline approach (also referred to as the foundation model approach), adopted one model as our foundation model, which is the SL CAPM.

NSPs, in submitting their proposals, have proposed a large number of deviations from our foundation model approach with respect the use of these models. The NSPs largely propose the same uses of the various models as they proposed in the Guideline process on mostly the same reasons.

174 AER, *Rate of return guideline*, 17 December 2013, p13.

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

Relevant material	Role	Reason for chosen role[175]
Sharpe Linter CAPM	Foundation model	It is expected to result in a return on equity that leads to an allowed rate of return that meets the rate of return objective. We consider it is a clearly superior return on equity model as part of our foundation model approach relative to alternative models and methods. It also best meets our selection criteria.
Fama French Three Factor Model	No role	Estimates from the model are not expected to lead to a rate of return that meets the rate of return objective. The model is not sufficiently robust or expected to calculate un unbiased return on equity estimate for the benchmark entity facing a similar degree of risk as Jemena Gas Networks.
Black CAPM: (a) empirical results (b) theoretical principles	(a) No role (b) Inform equity beta point estimate	(a) Estimates from the model are not expected to lead to a rate of return that meets the rate of return objective. The model is not sufficiently robust or expected to calculate un unbiased return on equity estimate for the benchmark entity facing a similar degree of risk as Jemena Gas Networks. (b) The theory behind the model supports an adjustment may be warranted 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 DGM models published at the time of the Guideline to informing he MRP.[176] 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. The models and required data are not 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 for any purpose as it is not expected to lead to an unbiased estimate of the return on equity or lead to and a rate of return that meets the rate of return objective.
Wright CAPM	Limited to estimating a range to be used to informing the overall return on equity No role in directly estimating 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 the return on equity is stable. In the event the return on equity was outside this range, further investigation could be warranted. Given the 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 rf rate and the MRP), it is not expected to lead to an unbiased estimate of the return on equity, or to a rate of return that meets the allowed rate of return objective.
Long term CAPM specifications	No Role	Given the 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 rf rate and the MRP), it is not expected to lead to an unbiased estimate of the return on equity, or to a rate of return that meets the allowed rate of return objective.

175 The reason is a high level summary. Full reasons are provided in the following sections , the equity models appendix, , and in the Consulting reports by McKenzie and Partington and Handley
176 See: Appendix C; and AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp116-117.

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 draft decision.

SLCAPM

We use the SLCAPM as the foundation model. Consistent with our views expressed in December 2013,[177] we consider this model best meets our assessment criteria and is (at the current time) superior to all of the other models suggested by the NSPs for estimating the return on equity of the benchmark efficient entity. The new material submitted, that was not available at the time of the Guideline, has not changed our view on this. We do not consider the use of the SLCAPM as the foundation model will result in a downward biased estimate of the cost of equity capital.

We consider the SLCAPM is the most appropriate model to use for reasons including:

- 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. This includes that input parameter estimates are supported by robust, transparent and replicable analysis.
- 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 still provides some certainty to stakeholders as to the final return on equity value.
- The SLCAPM can be used to 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.
- There is no compelling evidence the return on equity estimate from the SLCAPM will be downward biased given our selection of input parameters.
- We do not consider the alternative return on equity estimates provided by the NSPs demonstrate our return on equity is too low.

We assessed the SLCAPM against the guideline assessment criteria and are satisfied that it is the most suitable model to use as the foundation model. Our assessment is in Table 3-6 and includes the following key reasons for using the SLCAPM as the foundation model:

- it is reflective of economic and finance principles and market information
- it is fit for our regulatory purpose as it was developed for estimating the cost of capital
- it can be implemented in accordance with good practice
- it is not unduly sensitive to errors in inputs or arbitrary filtering
- it uses input data that is credible and verifiable, comparable and timely and can be clearly sourced

[177] AER, *Explanatory Statement rate of return guideline*,17 December 2013, p64.

- is sufficiently flexible to allow for changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.

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. Estimation of the model takes into account relatively robust market data (proxies for the risk free rate based on government bonds; equity beta based on observed covariance of returns for proxy firms with the returns on a market proxy; and estimates for the market risk premium based on a range of information) Empirical shortcoming 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). Careful application of the model will tend to give estimates of the return on equity that are sensible and reasonably stable over time.
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. The estimation of input parameters for the SLCAPM, however is less complex than the estimation of input parameters for the Black CAPM and the Fama-French three factor model. This implies: ▪ the estimation of input parameters is likely to be relatively more robust and less likely to be unduly sensitive to errors in input estimation. ▪ the choice of data to be used in the estimation of 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. Information will generally be comparable and timely, although we note that often a trade-off exist in relation to timeliness

178 Z. Bodie, A. Kane, and A. J. Marcus, *Investments 5th ed*, McGraw-Hill Irwin, 2002, p263.

– credible and verifiable – comparable and timely – clearly sourced.	versus stability (e.g. 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 bond YTMs, empirical estimates of the other parameters (particularly the equity beta) adjust more slowly due to their relatively high reliance on historical information.

Following the submission of the regulatory proposals we commissioned Professor Michael McKenzie and Associate Professor Graham Partington (McKenzie and Partington) to review the use of the SLCAPM as the foundation model in consideration of the NSP full proposals and supporting documents.[179] We also commissioned Associate Professor John Handley (Handley) to undertake a subsequent high level review of the foundation model approach in light of McKenzie and Partington's report, the NSPs proposals, and three key expert finance reports by CEG, SFG and NERA submitted by the NSPs in support of the proposals.[180]

The reports from both McKenzie and Partington and Handley support our use of the SLCAPM as the foundation model.[181] Both reports indicate the authors consider the foundation model approach (using the SLCAPM as the foundation model) would be expected to lead to a rate of return that meets the allowed rate of rate of return objective.[182]

McKenzie and Partington indicate with respect to the SLCAPM:[183]

> 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 go on to state:[184]

> 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)

179 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.

180 John C. Handley, *Advice on the Return on Equity*, 16 October 2014.

181 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, pp9-14; John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p4.

182 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,pp13-14; John C. Handley, *Advice on the Return on Equity*, 16 October 2014. P3

183 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, p9.

184 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, pp9-10.

> 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 indicates with respect to the SLCAPM:[185]

> [t]he AER's choice of the Sharpe-CAPM as foundation model 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.

As part of this decision in response to NSP submissions we have considered if the use of the SLCAPM as foundation model in our foundation model approach would be expected to lead to a downward biased estimate of the return on equity of our benchmark entity.

In considering the issue of potential bias we have considered a wide range of material including:

- If there is evidence returns set previously based on the SLCPAM have discouraged investment.
- If our equity risk premium appears appropriate taking into consideration a range of factors. This has included consideration of the apparent risk facing the price regulated monopolies we regulate and the current risk debt risk premiums on our benchmark entities debt.
- If anything we are doing in applying the SLCPAM to estimate the required return on equity appears inconsistent with common financial market and investor practice.
- If our individual input parameters into the SLCAPM appear reasonable.

We consider the regime has been highly supportive of investment and the NSPs we regulate appear to have raised capital to support their investment programs. This suggests the continued use of the SLCAPM in our framework would be expected to be consistent with achieving the allowed rate of return objective and will continue to support efficient investment and use of regulated infrastructure.

We consider the movements in debt market yields since the prior regulatory decision 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 meets the allowed rate of return objective for the following reasons:

- 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 (discussed further under step 3 of the reasons for our return on equity decision).
- 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 (discussed further under step 3 of the reasons for our return on equity decision and in the MRP Appendix).

---

[185] John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p4

- 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 (discussed further under step 3 of the reasons for our return on equity decision and in the Equity Beta Appendix).

Our use of the SLCAPM and input parameters are consistent with the approaches employed by investors.

At our request, McKenzie and Partington also examined if there is anything to indicate 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 to this question McKenzie and Partington support our application of the foundation model and state:[186]

> We are of the view that the foundation model does not provide a downwardly biased estimate in this context.
>
> 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's report also notes in relation to the evidence (from other models) on low beta bias:[187]

> [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.

In determining if the SLCAPM is appropriate to use as the foundation model in our foundation model approach, we also considered if the NSPs alternative return on equity estimation methods would be expected to lead to a 'better' estimate of the return on equity.[188]

McKenzie and Partington at our request also examine if the addition of return on equity estimates from other models and sources as proposed by the NSPs would be expected to lead to a 'better' estimate of the return on equity. They conclude that alternative estimates might improve the return on equity estimate, however they make clear that they have significant reservations about the implementations of the alternative models as proposed by the NSPs.[189] We consider McKenzie and Partington's subsequent review of the alternative models proposed by the NSPs[190] supports our view that the alternative return on equity estimates provided by the NSPs should not be used for estimating the return on equity of our benchmark efficient entity. We also consider their review supports our conclusion that these alternate return on equity estimates provide no compelling evidence our return on equity will under compensate the benchmark entity facing a similar degree of risk as Jemena Gas Networks relative to its efficient equity financing costs.

---

186 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, p14.

187 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p5.

188 We note that there is no one estimate of the rate of return that will meet the allowed rate of return objective. Therefore, even if an NSPs' rate of return estimate was better than ours, this would not automatically mean our estimate would not meet the rate of return objective. However, we have asked the question as an appropriate cross check on our estimate and methodology.

189 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*, p14.

190 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, pp15-51.

Handley's report also supports our decision to not depart from the foundation model approach. He expresses the opinion there is nothing in the regulatory proposals from the NSPs and the three key consulting reports that provides compelling reasons to depart from the core framework underpinning the foundation model approach.[191] In considering this question he considers the Fama French model, the Black CAPM, and the DGM put forward by the NSPs to estimate the return on equity, and states:[192]

> 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 consider the NSPs various proposed alternatives to estimating the overall return on equity using a multi model approach, or to use the return on equity estimates from the alternative models to inform the SLCAPM input parameters, will not result in an allowed rate of return that meets the rate of return objective. We do not consider these return on equity estimates provided by NERA,[193] CEG,[194] and SFG,[195] provide compelling reasons for why we should not use the SLCAPM as our foundation model.

Further discussion of the SLCAPM is contained in the Equity Models Appendix.

Fama French Three Factor Model (FFM)

We do not rely on the Fama French Three Factor Model (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 and therefore do not employ it in our six step process, including not using it for:

- estimating the return on equity on our benchmark efficient entity
- performing a cross check on whether other models (including the SLCAPM) are coming up with reasonable estimates of the return on equity that will lead to an allowed rate of return that will meet the rate of return objective.

We do not consider the FFM based return on equity estimates put forward by the NSPs and their consultants provides material that alone, or in combination with other material, is useful for our regulatory task.

Having reviewed the new material submitted since the publication of the Guideline, we remain of the view the FFM is not suitable for use for the same reasons as we stated when we published 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.

191 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p6.
192 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p6.

These are consistent with the views we expressed when we published the Guideline indicating we would not use the FFM[196] and that the model largely did not meet our assessment criteria.[197]

Table 3-7 Summary of our assessment of the FFM against our 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 estimation of 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 not clear it is estimating ex-ante returns. The model is also complex with no clearly correct specification, and it 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 and 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 come up with different estimates of the realised return on equity with no clearly superior specification. It is unclear 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 the implementation of the FFM because there is no widely accepted correct method of application of the model (i.e. 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 models use for estimating expected returns on equity appears limited including very limited use, if any, by other regulators. The model is also not used broadly by Australian firms when valuing equity, or used in any mechanistic way.
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	The econometric derivation of the model leads to concerns about the potential for data mining. We consider the model may be applied to come up with a desired output (i.e. a higher or lower estimate of the required rate of return) and this creates significant concerns for its use to set regulated returns (even if all the other issues with the model could be overcome).

196 AER, *Rate of return guideline*, 17 December 2013, p13.

197 AER, *Explanatory Statement Rate of Return Guideline*, 17 December 2013, pp57-72 ; AER, *Explanatory Statement Rate of Return Guideline (Appendices)*, 17 December 2013, pp18-23 .

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 model is not sufficiently robust to not be unduly sensitive to errors in input estimation and there is significant arbitrary filtering or adjustment of data without sound rational in the application of the model. 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 and verifiable, comparable and 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 capital.
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 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.

The NSPs submitted a significant amount of information in support of the use of 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.

The majority of NSPs have argued that the FFM should be empirically used for estimating the return on equity capital.[198] The NSPs then use their empirical estimates of the return on equity from the FFM to do one or more of the following:

- to estimate their proposed return on equity (as part of a multi model approach)[199]
- 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[200]
- to provide evidence 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.[201]

---

198 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p79; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019,* 30 May 2014, p119; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p104; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p12; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p261; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p1.TransGrid

199 TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp12-13; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p274; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.TransGrid

200 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p79; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019,* 30 May 2014, pp119-120; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp105-106; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp188-190; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, pp273-276 Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.TransGrid

201 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp84-85; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019,* 30 May 2014, p126-127; Essential Energy, *Regulatory Proposal 1 July 2014 to 30*

Surveying the recent UK literature on estimating the FF model, Michou, Mouselli and Stark (2014) identify nine different methodologies that have been adopted.[202] The nine different methodologies generate substantially different results. Five of the nine methodologies yield a significant size premia but four of the nine do not. Four of the nine methodologies generate a significant value premia, but five of the nine do not. One principal conclusion of Michou, Mouselli and Stark is that the results of the FF model are highly sensitive to the methodology chosen, so that 'factor construction methods can matter in the use of factor models and, as a consequence, factor construction methods need to be considered carefully in empirical settings'.[203]

As a consequence, it is difficult and complex to evaluate any given implementation of an FF model.

McKenzie and Partington considered the FFM in light of the NSPs' proposals in detail in their report.[204] They support our decision to not use the model.[205] They express the following opinions about the model:

- They do not consider the FFM is capable of reliably estimating the return on equity of an benchmark efficient entity as the FFM is used to estimate the average return in the cross section and our 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.[206]
- The do not consider the FFM is likely to produce empirical estimates that are stable and consider the parameter instability in the literature as symptomatic of the weakness of the model.[207]

Handley also reviewed the NSPs proposals and some core WACC reports. He also supports our decision to not depart from the foundation model framework in light of these submissions[208] and notes with respect to the FFM:[209]

- The empirical evidence in support of the FFM does not necessarily mean the FFM is an appropriate model to estimate the regulatory return on equity.
- The empirical evidence in support of the model is now being questioned and 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.
- The model is not clearly determining return on the basis of risk.

June 2019, 30 May 2014, p112-113; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p191; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, pp262 Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, June 2014, p2.TransGrid

202 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, p1-14.

203 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, p12.

204 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, pp15-19.

205 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, p19.

206 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, p18

207 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, p18.

208 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, pp6-9.

209 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, pp7-9.

- If the model is not determining returns on the basis of risk '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.'[210]

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 the key issues with the model could be overcome. However, 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 the model was developed.

Further discussion of the FFM, the NSPs submissions with respect to the FFM and our responses to these submissions are contained in the Equity models Appendix.

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.

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 impacting on the SLCAPM. We consider this is consistent with our proposed use of the model at the time we published the Guideline. However, we don't 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.[211]

Having reviewed the new material submitted since the publication of the Guideline, we remain of the view empirical estimate of the return on equity from the Black CAPM are not suitable for any use for the following key reasons:

- the model is not empirically reliable
- the model is not widely used to estimate the return on equity by equity investors, academics or regulators.

These views are unchanged from the view we expressed when we published the Guideline.[212] We consider the model does not meet our assessment criteria well.

Table 3-8 Summary of our assessment of the Black CAPM against our 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, empirical implementation of the model is unreliable and we remain of the view there are difficulties aligning the theoretical models with available empirical analysis

210 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p8.
211 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, pp20-24.
212 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp16-18.

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 consider the empirical application of the Black CPAM is not fit for the purpose of setting or assessing any component of the regulated return on capital. The model was developed as a theoretical model that could explain empirical results that questioned the predictions of the SLCAPM. While complexity of itself is arguably not a decisive factor, although all else equal a simpler model is preferred to a more complex one, we consider the complexity around the models application and specification choices and the sensitivity of the model's output with respect to these choices, makes it not fit to be applied for a regulatory purpose 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 come up with a desired output (i.e. a higher or lower estimate of the required rate of return) and this creates significant concerns for its use to set regulated returns (even if all the other issues with the model could be overcome). The model is not sufficiently robust to not be unduly sensitive to errors in input estimation and there is 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 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 and verifiable, comparable and 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 capital.
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 adjustment of 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 assessment criterion does not make the output of any given model a valid estimate of the required return on equity.

We do not consider empirical estimates of the return on equity from the Black CAPM put forward by the NSPs and their consultants provides material that alone, or in combination with other material, is useful for our regulatory task. We do not rely on any empirical estimates for estimating the return on equity on our benchmark efficient entity or performing a cross check on whether other models (including the SLCAPM) are coming up with reasonable estimates of the return on equity lead to a rate of return that will meet the allowed rate of return objective. McKenzie and Partington considered the Black CAPM in light of the NSPs' proposals in detail in their report and their report supports our decision to not use empirical results from the Black CAPM. [213] Handley also considers the Black CAPM in his report and his report also supports our decision to not use empirical estimates from the model.[214] In summary, they note:

- the model is not based on more realistic assumptions than the CAPM and cannot be directly compared to the SLCAPM as they each involve very different investment strategies[215]
- while the model might be used for estimating the return on equity on the benchmark efficient entity, the problem is the model can be very sensitive to implementation choices[216]
- they would not recommend using the NSPs estimates from the Black CAPM to inform the equity beta given the practical difficulties with implementing the model[217]
- the model (of itself) does not justify any uplift to the equity beta[218]
- it is not widely used in practice because the estimation of the zero beta rate, which can fall anywhere below the expected return on the market, is a non-trivial task[219]
- the Black CAPM and low beta bias are not equivalent concepts and as such, the empirical results of Black Scholes and Jenson (1972) and Fama and French (2004) are not direct test of the Black CAPM[220]
- it is unclear low beta bias is a priced risk not already captured by the SLCAPM.[221]

Further discussion of the Black CAPM, the NSPs' submissions with respect to the Black CAPM and our responses to these submissions is contained in the Equity Models Appendix.

Dividend Growth Model (DGM)

We employ the DGM to inform the market risk premium (MRP). These models are specified in the Appendices to the Guideline.[222]

Having reviewed the material submitted since the Guideline, we remain of the view that estimates of the return on equity for the benchmark efficient entity generated from the DGM are currently not

213 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, pp20-25.
214 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, pp9-12.
215 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, p22.
216 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, p25.
217 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, p24.
218 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, p24
219 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p12.
220 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p10.
221 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p11
222 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp115-117.

suitable for our regulatory task. We consider it is not appropriate to use DGMs for the following purposes:

- estimating the return on equity on our benchmark efficient entity (including estimating a SLCAPM equity beta through generating relative risk premium measures)
- performing a cross check on whether other models (including the SLCAPM) are coming up with reasonable estimates of the return on equity that will lead to a rate of return that will meet the allowed rate of return objective.

We also do not consider empirical estimates of the return on equity (including relative risk premium based equity beta estimates to be used in the SLCAPM) from DGMs put forward by the NSPs and their consultants provides material that alone, or in combination with other material, is suitable of our regulatory task.

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

Criteria	DGM assessment against criteria for the purposes of 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	DGMs estimation reflects well accepted finance and economic theory. They are based on the principle that markets are efficient and the present value (i.e. market price) of a share reflects the discounted (present) value of its expected future dividends. Dividend growth models 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 DGM models are relatively simple. We consider the models are fit for estimating a range within which the MRP is likely to fall for the purposes of informing our choice of MRP to use in the SLCAPM. However, we consider DGMs are note widely used for estimating the MRP (or return on equity) in the Australian context.
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 avoids arbitrary filtering or adjustment of data, which does not have a sound rationale.	DGM estimates are highly sensitive to changes in the interest rates. DGMs are also highly sensitive to assumptions in relation to the short term and long term dividend growth rates. This makes DGMs highly sensitive to potential error
Where market data and other information is used, this information is:	With the exception of the short and long term dividend growth estimates the input parameters for estimating the DGM are generally credible and verifiable, comparable and timely and can be clearly sourced, although evidence

– credible and verifiable – comparable and timely – clearly sourced.	suggests analysts forecasts are overly optimistic.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	Readily incorporates changes in the market data. However, DGMs may not track these changes accurately. DGMs can also generate volatile and conflicting results.

Having fully reviewed the new material submitted since the publication of the Guideline, we remain of the view DGM based empirical estimates of the return on equity for our benchmark efficient entity are not suitable for any regulatory use for the following reasons:

- The models are not robust given they are highly sensitive to input assumption in relation to the short term and long term growth rate of dividends. This makes the models highly sensitive to potential error in inputs.
- The models are highly sensitive to changes in the risk free interest rate.
- The models may generate volatile and conflicting results.

At the time we published the Guideline we expressed the view we would employ the DGM to inform the MRP because we considered data for this purposes was sufficiently robust.[223]

The majority of NSPs have submitted that empirical estimates from the DGM should be used for estimating the return on equity.[224][225] The NSPs then use their empirical estimates of the return on equity to do one or more of the following:

- to estimate their proposed return on equity (as part of a multi model approach, or to inform input parameters into the SLCAPM)[226]
- 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[227]
- to provide evidence 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.[228]

---

223 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp14-15.

224 TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p12; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p261; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, pp1-2. TransGrid

225 SFG, *The required return on equity for regulated gas and electricity network businesses Report for Jemena Gas Netowrks, ActewAGL Distribution, Ergon, Transend and SA Power Networks*, May 2014, p11.

226 TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp12-13; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p274; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.TransGrid

227 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p85; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019,* 30 May 2014, pp128-129; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp114-115; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp188-190; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, pp273-276; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.TransGrid

McKenzie and Partington considered the DGM in light of the NSPs proposals in detail in their report.[229] They support our decision not to use the model to directly estimate the return on equity for utilities.[230] They also indicate they are not convinced the use of estimates from SFG's DGM model will lead to a materially better estimate of the return on equity relative to our approach[231] and indicate prior to its use it would be appropriate to have substantial agreement on its superiority (over well established models) in the research literature and/or extensive use of the model in practice.[232] They do support the use of the DGM to inform the MRP estimate, although they indicate they have concerns around its reliability and give a number of reasons there is a significant risk it will over-estimate the MRP and return on equity.[233] They also indicate they consider SFG's model might be used to generate virtually any Return on equity desired.[234]

Handley also reviews the submissions on the DGM and supports our decision to not use estimates based on the SFG model.[235] He considers 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.[236] He also states with respect to DGMs more generally:[237]

> 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 goes on to demonstrate DGMs shift the uncertainty to the growth rate through showing that a constant growth DGM return on equity simply equals the expected dividend yield next period plus the growth rate.[238] He then states he considers it unclear the return on equity estimates from two and three stage models are any more meaningful.[239]

Further discussion of the DGM, the NSPs submissions with respect to the DGM and our responses to these submissions, and our assessment of the model against our criteria, is contained in the return on equity appendix.

Other SLCAPM specifications (Wright and long term)

Point estimates of the return on equity from the Wright SLCAPM specification and historically based 'long term' SLCAPM specification have not been used to inform our estimate of the return on equity of

---

228 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp85; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019,* 30 May 2014, pp128-129; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp114-115; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p191; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, pp262 Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.TransGrid

229 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, pp26-41.

230 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, pp39-40.

231 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, p40.

232 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, p27.

233 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, pp39, 27-31.

234 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, pp34-35.

235 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, pp13-15.

236 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, pp15..

237 John C. Handley, *Advice on the Return on Equity*, October 2014, pp13-14.

238 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p14.

239 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p15.

the benchmark efficient entity. However, we have used a range from the Wright SLCAPM specification to inform the overall return on equity (although we note we have placed little reliance on this information given our concerns with the Wright 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 on our 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.

Having fully reviewed the new material submitted since the publication of the Guideline, we remain of the view that the range from the Wright SLCAPM specification can be used to inform the overall return on equity for the same reasons as we stated when we published the Guideline.

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 SLCAPM specifications are:

- the models are not theoretically justified. The SLCAPM is a forward looking equilibrium asset pricing model and therefore requires forward looking input parameters
- no compelling empirical evidence has been provided to support the use of the model
- the models are not generally accepted by market practitioners, academics or regulators
- the models do not take into account changing market conditions and therefore are unlikely to (at a given point in time) estimate an unbiased forward looking estimate of the required return on equity of the benchmark efficient entity.

We consider these models do not meet our selection criteria particularly well as shown in Table 3-10.

Table 3-10 Summary of our assessment of the alternative SLCAPM specifications (wright and long term average) against our criteria

Criteria	Long term 'average' specification	Wright specification
Where applicable, reflective of economic and finance principles and market	The long term average specification assumes the return on equity is very stable through time. This is not supported by well	The Wright approach appears to either

information. Estimation methods and financial models are consistent with well accepted economic and finance principles and informed by sound empirical analysis and robust data	accepted economic and finance principles. The empirical analysis does not clearly support the model specification.	assumes: ▪ The standard approach to estimating the risk free rate and MRP is inconsistent[240]; or ▪ The real market cost of equity is constant and therefore the risk free rate and the MRP are perfectly negatively correlated.[241] The first assumption would be incorrect, while the second assumption is not clearly theoretically supported, and the empirical evidence is not compelling.[242]
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 long term specification is relatively simple to implement. However, we do not consider it fit for estimating a forward looking return on equity since it relies on historical data.	The Wright specification is relatively simple to implement. However, we do not consider it fit for estimating a forward looking return on equity since it relies on historical data.
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 rationale.	The long term specification is an application of the SLCAPM. As outlined in Table 3-6, the SLCAPM performs well against this criteria	The Wright specification is an application of the SLCAPM. As outlined in Table 3-6, the SLCAPM performs well against this criteria
Where market data and other	The long term specification uses credible,	The Wright specification uses credible,

240 John C. Handley, *Advice on the Return on Equity*, October 2014,, p17.

241 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p17; 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.

242 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, pp17-18.

information is used, this information is: – credible and verifiable – comparable and timely – clearly sourced.	verifiable, publically available market date.	verifiable, publically available market date.
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.

The NSPs have submitted a range of material in support of the use of these models. This is largely considered in step 3 of the foundation model approach in relation to the selection of the risk free rate section and in step 4 in relation to the use of the Wright approach. While we have used the range from the Wright approach, we note that Handley has questions the theoretical and empirical support of the model[243] and accordingly we have placed little reliance on this information.

In relation to the Wright approach, Handley considered the model in his report.[244] He stated in relation to the model:[245]

> 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.
>
> 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.[246] 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 riskfree rate, the implied equity premium must move point by point in the opposite direction.[247]
>
> 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 Handley's comments appear equally applicable to the 'long term' SLCAPM specification proposed by a number of NSPs.

243 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, p18.
244 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, pp15-18.
245 John C. Handley, *Advice on the Return on Equity*, 16 October 2014, pp17-18.
246 CEG, WACC Estimates A report for NSW DNSPs, May 2014, pp3-4.
247 Wright, S., 2012, Review of risk free rate ad cost of equity estimates: A comparison of UK approaches with the AER, 25 October 2012, pp2-3.

Further discussion of these non-standard SLCAPM specifications is contained in the Equity Models Appendix. The proposal to use a historical based risk free rate is also discussed under step 3 of the reasons for our return on equity decision.

Risk free rate

Table 3-2 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 assigned to 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. [248] 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 out this assessment. This has helped us determine the role we give this information in estimating the MRP, as shown in table 3-12.

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 the criteria. The main limitation is it sensitivity to assumptions, which is significant. Since it readily incorporates 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	Given some reliance (directional information	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

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

spreads, implied volatility)	only)	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 C–DGM)
Imputation credit adjustment (AER, Brailsford et al)	Adjust estimate under the DGM and historical excess returns	This is consistent with economic and finance 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.

Equity beta

Our assessment in step one has helped us consider the relative strengths and limitations of different sources of information which is set out in Table 3-4. 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 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 C). 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).

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 have given each source of relevant material, based on the rate of return 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.

Table 3-14 Role of information used to inform 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	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, the rate of return objective is not 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

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 JGN, we consider that the return on equity is shielded from systematic risk due to:

- Legislative and natural monopoly positions providing a barrier to competition.
- Limited demand risk as they supply essential goods with a low elasticity of demand and they operate under a revenue cap pricing regime.
- The application of revenue control mechanisms, including that:
  - a revenue cap removes a significant amount of the revenue risk from unexpected changes in demand
  - a revenue control mechanism limits the interest rate risk facing the firm
  - the regulatory asset base is indexed to the outturn Consumer Price Index limiting risk from unexpected changes in inflation
  - unexpected costs may be passed through to consumers in many circumstances.

Origin Energy, in its submission on the NSW DNSPs' regulatory proposals, also noted the low risk of these businesses and implied that the overall cost of capital should not be a long way above the cost of a corporate bond. This appears to indicate that it considers the expected return on equity would not be expected to be a long way above the YTM on debt. We consider this submission also applies to gas pipeline services. 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:[249]

> 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.

249 Origin, *Submission to NSW electricity distributors' regulatory proposal*, August 2014, p. 7.

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.[250]

Notably, no academic consensus currently exists on the size and strength of any relationship between debt and equity premiums.[251]

Given the inconclusive evidence on the size and strength of any relationship between debt and equity premiums, this information is best used in a directional role.

TransGrid proposed using comparison of return on equity estimates to observed bond yields as a reasonableness check on the overall return on equity estimate.[252] This approach broadly aligns with our proposed role for this information.

Table 3-15 below outlines our assessment of this information against the criteria in the AER guideline for determining an appropriate role for relevant information.

Table 3-15 Assessment of return on debt material against the guideline 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 is acknowledged by providing only a directional role to this information.
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	Not applicable, analysis involves only a simple comparison.

250 Expected returns on debt may be lower than promised returns after consideration of default risk. For more, see: Michael McKenzie and Graham Partington on behalf of the Securities Industry Research Centre of Asia Pacific (SIRCA) Limited, *Report to the AER: the relationship between the cost of debt and the cost of equity*, 14 March 2013, p. 7.

251 McKenzie and Graham Partington on behalf of the Securities Industry Research Centre of Asia Pacific (SIRCA) Limited, *Report to the AER: the relationship between the cost of debt and the cost of equity*, 14 March 2013, p. 10.

252 TransGrid, *Revenue Proposal*, 2014/15–2018/19, p. 188; NERA, *Return on capital of a regulated electricity network*, May 2014, pp. 114–118.

errors in inputs estimation

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 JGN. 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,[253] brokers and independent experts providing valuation reports are subject to financial services regulation and regulatory oversight by ASIC.[254] 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.

253 Incenta Economic Consulting, *Update of evidence on the required return on equity from independent expert reports*, May 2014, p. 6.

254 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.

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 to the 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 company specific and therefore not directly comparable to our benchmark entity.

These limitations are discussed further in the return on equity appendix. 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.

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.[255]

TransGrid proposed using Grant Samuel's independent valuation of Envestra to directly inform the return on equity range.[256] We do not consider that TransGrid's proposed role of valuation reports promotes the rate of return objective given the limitations mentioned above. ActewAGL and JGN proposed using broker and valuation reports to inform estimates of the market risk premium.[257] We note that consideration of the market risk premium estimates from broker and valuation reports is included in our consideration of the overall return on equity estimates from these reports (since the market risk premium is one component of the overall return on equity). Detailed assessment of the MRP proposals by TransGrid, ActewAGL, and JGN are also in the return on equity appendix.

Table 3-16 below outlines our assessment of this information against the criteria in the AER guideline for determining an appropriate role for relevant information.

---

[255] 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.

[256] TransGrid, *Revenue Proposal*, 2014/15–2018/19, p. 189.

[257] 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*, 2 June 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 Transend*, 27 May 2014, p. 5–8, 74–79.

Table 3-16 Assessment of market practitioner material against the guideline 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 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 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 appropriate	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 infrequent.

Realised returns

The CCP submitted that we should consider material on realised returns to equity from transaction multiples and businesses' financial statements.[258] Transaction multiples involve comparison of the market value (that is, the sale price) with the book value (that is, the regulatory asset base) for a relevant asset comparable to our benchmark entity. If the market value is above the book value (a transaction multiple greater than 1xRAB), 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 1x RAB might be the result of 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 level of the return required by investors. However, the extent to which these multiples significantly and persistently differ from unity 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 the rate of return objective would be furthered by providing any significant role to this material.

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 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 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 the criteria in the AER guideline for determining an appropriate role for relevant information.

Table 3-17 Assessment of realised returns against the guideline criteria

Criteria	Assessment of relevant material against criteria

[258] 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.

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 adjustments or filtering of cash flows from unregulated activities or outperformance of regulatory benchmarks may be more arbitrary than robust.
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. But arbitrary adjustments or filtering of financial statements may be involved in removing cash flows from unregulated activities and outperformance of regulatory benchmarks.
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. But arbitrary adjustments or filtering of financial statements may be involved in removing cash flows from unregulated activities and 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. As per the guideline, that step 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 achieving the allowed rate of return objective.

Step three: Implementing the foundation model

Based on our assessment under step one and two we adopt the SL CAPM 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 in this sub section.

Risk free rate

We have used an indicative risk free rate of 3.55 per cent in this draft decision. This risk free rate is based on a 20 business day indicative averaging period, from 17 September 2014 to 15 October

2014. We will update this risk free rate for the final decision, using the period JGN proposed.[259] We accept JGN's proposed averaging period because we consider it will contribute to the achievement of the rate of return objective. We consider the risk free rate we will apply provides for a return on equity that contributes to the achievement of the allowed rate of return objective.[260] That is, it is a forward looking risk free rate commensurate with prevailing conditions in the market for funds at the commencement of the regulatory control period.[261] As such, this risk free rate also has regard to the prevailing conditions in the market for equity funds, as the rules require.[262] Specifically, on the risk free rate proxy, we apply:

- the yield on Commonwealth Government Securities (CGS)
- a 10 year term.

And, on the risk free rate averaging period, we adopt a period that is:

- short—specifically, 20 consecutive business days in length[263]
- as close as practicably possible to the commencement of the regulatory period.

On 14 April 2014, we proposed an averaging period satisfying these criteria to JGN as a 'default' option. We also gave JGN the opportunity to nominate an alternative averaging period that satisfied these criteria. We developed this approach because:

- Previously, the onus was on service providers to propose their own averaging period subject to our criteria. This approach facilitated service providers in organising their financial arrangements in advance.[264]
- In the draft Guideline we proposed moving away from providing service providers with the flexibility to determine the exact dates of the risk free rate averaging period for the return on equity.[265] This was because our previous approach resulted in concurrent determinations having different return on equity allowances, without a particular economic reason for this occurring.[266]
- In the final Guideline, we had regard to the benefits and limitations listed above. We did not specify whether or not service providers would nominate their own risk free rate averaging period for the return on equity.[267]

When proposing an averaging period to JGN, we expressed our intention to apply our proposed averaging period in absence of a response by 31 May 2014.[268] Where service providers proposed an alternative averaging period consistent with our specifications, we have accepted this.[269] JGN

259 JGN, *2015–20 Access arrangement information, Appendix 9.2 averaging period proposal*, 30 June 2014, p. 1 (confidential).
260 NGR, r. 87(6).
261 AER, *Explanatory statement rate of return guideline,* 17 December 2013, p. 74.
262 NGR, r. 87(7).
263 For clarity, service providers can select longer periods for estimating the risk free rate used in the return on debt.
264 See AER, *Explanatory statement rate of return guideline,* 17 December 2013, p. 76.
265 AER, Explanatory statement to the draft rate of return guideline, August 2013, p. 211.
266 See, for example, AER, *Final decision: APA GasNet, March 2013, Part 2, p. 55; AER, Final decision: Access arrangement final decision: SPI Networks (Gas) Pty Ltd 2013-17*, March 2013, Part 2, p. 75; AER, *Final decision: Access arrangement final decision: Envestra Ltd 2013-17, March 2013, Part 2*, p. 114; 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 2, p. 97.
267 AER, *Explanatory statement rate of return guideline,* 17 December 2013, p. 76.
268 General Manager—AER Networks, *Return on equity risk free rate averaging period for 2014–19*, 14 April 2014 (Confidential).
269 JGN proposed an alternative averaging period 20 consecutive businesses days in length and as close as practically possible to the commencement of the regulatory period. JGN, *2015–20 Access arrangement information, Appendix 9.2 averaging period proposal*, 30 June 2014, p. 1 (confidential).

proposed an alternative period, which we have accepted. We will keep this period confidential until it expires.[270]

We accept the averaging period JGN proposed to us because we consider this 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.[271] The explanatory statement to the Guideline sets out why we consider this is the case.[272] These reasons include, but are not limited to:

- At any point, the prevailing risk free rate is the benchmark that returns on risky investments must outperform. Further, prevailing 10 year CGS yields reflect expectations of the risk free rate over the appropriate forward looking investment horizon (10 years).[273] A short term averaging period is a pragmatic alternative to using a prevailing rate.[274] This provides a reasonable estimate of the prevailing rate while not exposing service providers to unnecessary volatility.[275]

- Selecting an averaging period in advance reduces the potential for bias. Service providers have an incentive to seek an allowed rate of return that is as high as possible, because it will increase their revenue allowance. If a service provider can select an averaging period by looking at historical yields, it is likely to introduce an upward bias.[276] But, when an averaging period is agreed upon or specified in advance, opportunistic behaviour is less likely because the risk free rate is unknown for that future period.

We give service providers the opportunity to nominate their own averaging period, as long as it meets the requirements set out above. When specifying this previously, we noted service providers generally manage their borrowing and hedging arrangements around the nominated averaging period to reduce their exposure to interest rate risk.[277] Therefore, allowing service providers some control of the averaging period gives them the opportunity to organise their financial arrangements in advance.[278]

Market risk premium

Under the SLCAPM, the MRP is the difference in returns between a risk free asset and the expected return on the market as a whole. 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.

We adopt a point estimate of 6.5 per cent for the MRP. This is from a range of 5.1 to 7.8 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.[279] We consider this approach 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.[280] The Australian Competition Tribunal upheld our approach to estimating the MRP when APA

---

270 General Manager– AER Networks, *Return on equity risk free rate averaging period for 2014–19*, 14 April 2014 (Confidential).

271 NGR, r. 87(6) and 87(7).

272 See AER, *Explanatory statement rate of return guideline,* 17 December 2013, pp. 74–82.

273 AER, *Explanatory statement rate of return guideline,* 17 December 2013, pp. 48–49.

274 Lally, *The present value principle*, March 2013, p. 5.

275 Lally, *Risk free rate and present value*, August 2012, p. 7.

276 Lally, M., *Expert Report of Martin Thomas Lally*, 13 February 2011, pp. 9–10.

277 AER, Final decision: APA GasNet, March 2013, Part 3, p. 45.

278 See AER, *Explanatory statement rate of return guideline,* 17 December 2013, p. 76.

279 AER, *Rate of return guideline*, 17 December 2013, p. 16.

280 NGR, r. 87(6) and 87(7).

GasNet appealed our decision in 2013.[281] The MRP approach brought before the Australian Competition Tribunal was similar to that applied in this decision.[282]

Based on the evidence before us, we consider a range of 5.1 to 7.8 per cent is reasonable for the MRP under current market conditions. This is because:

- The geometric mean historical excess return currently provides the lowest estimate of the MRP with a range of 4.0 to 4.9 per cent. Professor McKenzie and Associate Professor Partington (McKenzie and Partington) advise that 'the unbiased estimator of the MRP lies between the arithmetic average and the geometric average'.[283] Therefore, while we have regard to geometric averages, we consider a reasonable estimate of the lower bound will be above the geometric average (see appendix B–MRP). [284] Therefore, we apply a lower bound estimate of 5.1 per cent. The arithmetic average provides a range of 5.9 to 6.5 per cent.
- The DGM currently provides the highest estimate of the MRP at about 7.8 per cent.[285] 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.[286]

In deciding upon our point estimate of 6.5 per cent, we considered the following sources of evidence (see appendix B–MRP how we derive these estimates):

- Historical excess returns—these estimates provide a range of 5.9 to 6.5 per cent if calculated using an arithmetic mean and a range of 4.0 to 4.9 per cent if calculated using a geometric mean. We consider 6.0 per cent a reasonable estimate based on this source of evidence.
- DGMs—these estimates, from two applications of the DGM and a range of inputs, suggest a range of 6.6 to 7.8 per cent is reasonable for the two months to end September 2014.[287]
- Survey evidence—surveys of market practitioners indicate that MRPs applied in Australia cluster around 6.0 per cent.[288] This holds when considering averages, medians and modes across surveys.
- Conditioning variables—This informs us the following:
    - Dividend yields are close to their historical averages. These have been relatively steady for over the last 12 months. This suggests that market conditions are stable.

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

282 The most notable change to our approach is that we now place more reliance on DGMs.

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

284 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.

285 We derive this using the upper bound of our assumptions concerning the long term dividend growth rate. As such, this is a conservatively high estimate using our construction of the DGM. This estimate is for the two months ending September 2014.

286 NGR, r. 87(7).

287 This end date is as close as practical to the publication of this decision. This is also similar to the end of the indicative averaging period used for the risk free rate (15 October 2014).

288 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.

- Credit spreads are falling but appear to be levelling off. Most credit spreads are above their pre-2007 levels. However, the swap rate spread is below its pre-2007 levels. This suggests that market conditions are stabilising overall.

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

- We also considered recent decisions among Australian regulators. The Essential Service Commissions of Victoria and South Australia (ESCV, ESCOSA), the Utilities Commission of the Northern Territory and the Economic Regulatory Authority (ERA) have consistently adopted MRP estimates of 6.0 per cent.[289] The Independent Pricing and Regulatory Tribunal (IPART) use historical excess returns and DGMs, and has recently applied higher estimates of the MRP.[290] The Queensland Competition Authority (QCA) recently reviewed its approach and will now apply a MRP estimate of 6.5 per cent, based on historical excess returns, survey evidence/independent expert reports, DGMs and conditional information.[291]

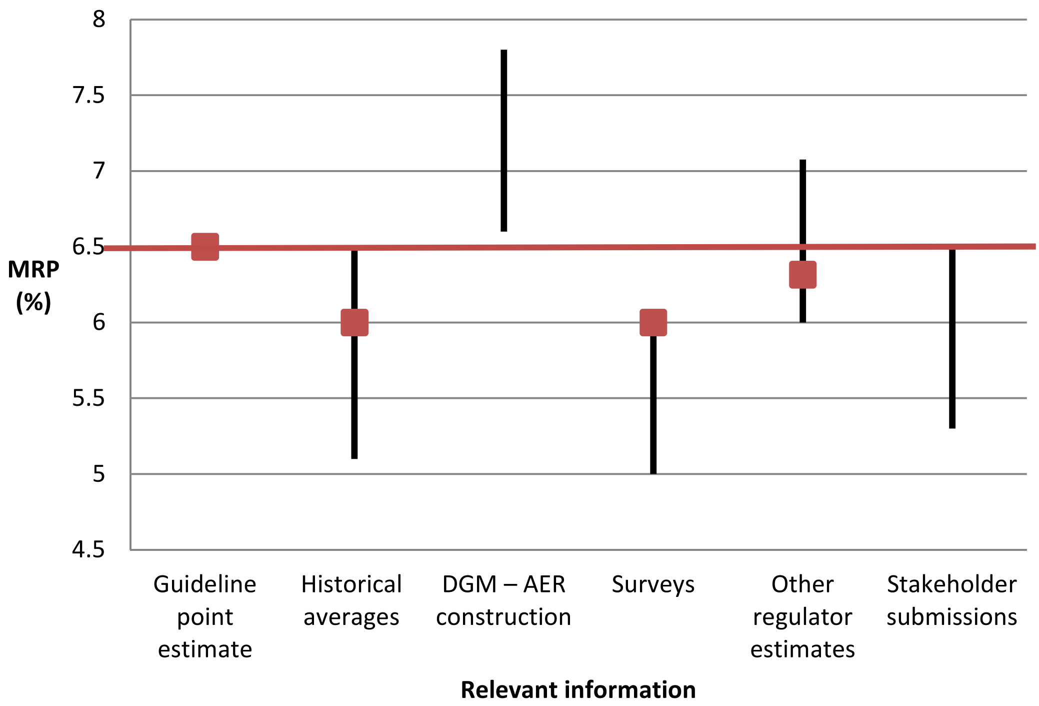
Figure 3-5 displays our estimates of the MRP using historical excess returns, DGMs, surveys and other regulators' decisions. The squares represent point estimates, the vertical lines represent ranges and the red horizontal line represents our point estimate of 6.5 per cent.

289 See recent decisions for the ERA, the Utilities Commission, ESC and ESCOSA, For example— ERA, *Determination on the 2013 WACC for the freight and urban railway networks*, July 2013; Utilities Commission, *Network price determination, Part A—Statement of reasons*, April 2014, p. 125;ESC, *Price review 2013: Greater metropolitan water businesses - Final decision*, June 2013; ESCOSA, *SA Water's water and sewerage revenues 2013/14-2015/16: Final determination - Statement of reasons*, May 2013.

290 For example, in July 2014, IPART considered DGMs estimated indicative MRPs between 7.6 to 8.7% and long term average historical excess returns estimated a mid-point MRP of 6.0 %, from a 5.5 to 6.5% range. Since IPART used a mid-pint WACC, we have calculated that an average of these estimates would produce an effective MRP of 7.1%. 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; IPART, *Essential Energy's water and sewerage services in Broken Hill*, June 2014, p. 161 ; IPART, *Hunter Water Corporation: Final report*, June 2013; IPART, *Gosford City Council and Wyong Shire Council, Water - Final Report*, May 2013.

291 For historical excess returns, the QCA uses Ibbotson and Siegel estimates. For its DGM estimates, the QCA uses Cornell DGMs.. See QCA, *Final decision: Cost of capital market parameters*, August 2014, p. 23.

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 on the MRP is 6.3 per cent. In July 2014, IPART applied an effective MRP of 7.1 per cent, which forms the top of our range. The bottom of this range is 6.0 per cent — the latest estimates the ESCV, ESCOSA and QCA applied.[292]
The bottom and top of the stakeholder range comes from UnitingCare Australia and Origin respectively. The top also comes from submissions that support applying values consistent with the guideline, like the EMRF.[293]

Together, this information indicates that 6.5 per cent reasonably reflects prevailing conditions in the market for equity funds.[294] As such, we consider an MRP of 6.5 per cent provides for a return on equity that contributes to achieving the allowed rate of return objective.[295]

JGN applied SFG's estimate of the MRP— which is 7.21 per cent.[296] In forming this estimate, SFG used historical excess returns, the Wright approach, SFG's DGM and independent expert reports. By contrast, submissions addressing this topic typically recommended an MRP below 6.5 per cent. After considering all of these submissions and the available evidence, we are satisfied with an MRP of 6.5 per cent.

Submissions on the MRP to JGN recognised the importance of applying the Guideline and accepting it as a package that balances the interest of stakeholders.[297] AGL recognised stock market analysts generally considered the MRP approach in the Guideline as a positive surprise.[298]

---

292 IPART, *NSW rail access undertaking review of the rate of return and remaining mine life— Transport final report and decision*, July 2014, p. 13; 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; ESCOSA, *SA Water's water and sewerage revenues 2013/14-2015/16: Final determination - Statement of reasons*, May 2013.

293 UnitingCare Australia, *Submission to the AER*, 3 September 2014, p. 19; Origin, *Submission to ActewAGL's regulatory proposal*, 20 August 2014, p. 4; EMRF, *Submission on TransGrid's revenue proposal 2014–2019*, 8 August 2014, p. 8.

294 NGR, r. 87(7).

295 NGR, r. 87(6).

296 SFG, *The required return on equity for regulated gas and electricity network businesses*, June 2014, p. 8.

297 Submissions to JGN— PIAC, *Things to like, things to check: PIAC submission to the AER's review of prices for JGN from 1 July 2015*, 25 August 2014, p. 2; EMRF, *AER NSW Gas Distribution Revenue Reset Jemena Application: A*

Consistent with our task for this decision, we have considered all relevant material anew to estimate a forward looking MRP. Similarly, we will consider the data before us for our final decision. This is consistent with the rules, which require us to have regard to prevailing conditions in the market for equity funds.[299] This is also consistent with the approach set out in the Guideline. Appendix B–MRP sets out why we consider our approach, as set out in our Guideline, contributes to achieving the allowed rate of return objective.[300] Similarly, appendix B–MRP provides further details on why our approach produces an estimate of 6.5 per cent in current market conditions.

JGN applied SFG's estimate of the MRP— which is 7.21 per cent.[301] This combined SFG's estimates under historical excess returns, the Wright approach, SFG's DGM and independent valuation reports; weighted 20, 20, 50 and 10 per cent respectively. SFG also adjusted the MRP for the value of imputation credits.

We have already discussed why we only apply the Wright approach and independent valuation reports at the overall return on equity level (see table 3-10, table 3-16 and table 3-14). Further, we have also discussed why we consider market surveys, conditioning variables and regulatory decisions provide valuable information for informing the estimate of the MRP (see table 3-3 and appendix B–MRP). We consider these sources of evidence have informative value.

We agree with using historical excess returns and DGMs to inform the estimate of the MRP. We also agree with adjusting the MRP for the value of imputation credits. However, SFG proposed alternative ways of applying historical excess returns and the DGM to our preferred approach, as set out in the Guideline.[302] It also proposed applying an alternative imputation adjustment to selected pieces of evidence.[303] We have regard to the alternative approaches SFG has put before us. However, we apply our approaches, because we are not convinced with the following:

- Using SFG's construction of the DGM. Importantly, we consider SFG's DGM produces implausibly high long term dividend growth rates. Consequently, this would prevent SFG's DGM from producing estimates that are commensurate with the efficient financing costs of a benchmark efficient entity (see appendix C–DGM).

- Using SFG's proposed adjustment for imputation credits. Applying the adjustment formula, as SFG proposed, could produce unusual results that overstate the MRP because it can only hold in perpetuity. For a detailed discussion on our preferred adjustment for imputation credits, see section (see appendix B–MRP).

- Using SFG’s estimates of historical excess returns. SFG's applied NERA's adjustment to historical excess returns.[304] We do not consider this adjustment warranted, nor does it improve the accuracy of the estimate. Further, SFG's estimate only gave consideration to sample period 1883–2013. Given the significant issues with early data, we consider it reasonable to have regard to the range of sample periods used by Brailsford et al.[305] Further, while SFG only had regard to

---

response by the EMRF, August 2014, p. 11; AGL, *JGN Access Arrangement 2015-20 AGL submission to the AER*, 25 August 2014, p. 8.

298 AGL, *JGN Access Arrangement 2015-20 AGL submission to the AER*, 25 August 2014, p. 8.

299 NGR, r. 87(7).

300 NGR, r. 87(6).

301 SFG, *The required return on equity for regulated gas and electricity network businesses*, June 2014, p. 8.

302 See AER, *Explanatory statement to the rate of return guideline (appendices)*, 17 December 2013, pp. 78–83 for our approach to historical excess returns. See pp. 114–125 for our construction of the DGM.

303 SFG applies an alternative imputation adjustment to its estimates form DGMs and independent expert reports. However, it applies the same adjustment we use to historical excess return sand the Wright approach.

304 For a detailed discussion on the adjustment, see NERA, *The market, size and value premiums*, 2013.

305 Brailsford, Handley, Maheswaran, ‘Re-examination of the historical equity risk premium in Australia’, *Accounting and Finance*, Vol. 48, 2008, p. 86.

arithmetic averages; we also have regard to geometric averages. This is consistent with McKenzie and Partington's advice, 'the unbiased estimator of the MRP lies between the arithmetic average and the geometric average'.[306] The Australian Competition Tribunal has found no error with this approach.[307] See appendix B–MRP for a detailed discussion on how we apply historical excess returns to estimate the MRP.

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).[308] Because the SLCAPM works on the basis that investors can diversify away business–specific risk, only systematic (non-diversifiable) risk is relevant for determining equity beta.[309]

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.[310]

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.[311] 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.[312]

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 report.[313]

We consider the evidence in Henry's 2014 report suggests a best empirical equity beta estimate of approximately 0.5.[314] 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:

---

306 McKenzie and Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, p. 5.
307 Australian Competition Tribunal, *Application by Envestra Ltd (No 2) [2012] ACompT4*, 11 January 2012, paragraph 157.
308 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.
309 McKenzie and Partington, *Risk, asset pricing models and WACC*, June 2013, pp. 21–22;
310 NGR, rule 87(2)(3).
311 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 appendix D.2.3) because they are more likely to be reflective of prevailing market conditions.
312 As discussed in detail in appendix D.2.2, 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.
313 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 10–12.
314 We consider most of the equity beta estimates from Henry's 2014 report are clustered around 0.5 (see appendix D.2.3). In forming this view, we consider averages of individual firm estimates and fixed weight portfolio estimates.

- Empirical estimates of international energy networks—The recent international empirical estimates we consider range from 0.45 to 1.14.[315] 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 appendix D.3.

- 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.[316] 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.[317] 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 appendix 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 achieving 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. The AEMC and stakeholder submissions to the 2012 rule change process accepted these views.[318]

After taking these considerations into account, we adopt an equity beta point estimate of 0.7 for this draft 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 very 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.[319] 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

315 See appendix D.3 for more information. The lower bound reflects FTI Consulting's weighted average estimate for three UK energy network firms and the upper bound reflects an average of the Brattle Group's estimates for three US energy network firms. See: FTI Consulting, *Cost of capital study for the RIIO-T1 and GD1 price controls*, July 2012, p. 42; The Brattle Group, *The WACC for the Dutch TSOs, DSOs, water companies and the Dutch pilotage organisation*, March 2013, p. 16.

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

317 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 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.

318 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.

319 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.

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.[320] For example, the EMRF submitted that:[321]

> Consumers have argued that the AER's figure of 0.7 is high because the empirical data provided to the AER by its consultants indicated a range of 0.4 to 0.7 with a median value of around 0.5 – 0.6.

Conversely, JGN submitted that our equity beta point estimate of 0.7 is too low.[322] JGN proposed a multiple–model approach applied by SFG to determine the return on equity estimate. In applying this approach, SFG adopted an equity beta estimate of 0.82 for the SLCAPM, based on a comparator set of both Australian and US energy firms.[323] JGN submitted that this estimate is conservative, as gas businesses are generally more risk–exposed than electricity businesses. JGN also submitted that if we adopt the foundation model approach, then the equity beta estimate should be adjusted to reflect evidence from all relevant financial models in order to correct for all the limitations of the SLCAPM.[324] It therefore proposed SFG's alternative 'foundation model' approach, which incorporates evidence from four financial models into a 'composite equity beta' of 0.91.[325]

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.[326] 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, FFM or SFG's construction of the DGM (see appendix A and C). 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 appendix A.2.1).

Our equity beta point estimate provides a balanced outcome, given the submissions by stakeholders and services providers. Figure 3-6 shows our equity beta 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 and RPP.[327] We provide a detailed analysis of technical issues and responses to JGN's proposal in appendix D.

---

320 CCP, *Submission to TasNetworks' revenue proposal for 2014–19*, September 2014, p. 8. While this is not a submission to JGN'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 our draft decision equity beta estimate for each service provider. See also: EMRF, *Submission to Jemena Gas Networks' access arrangement proposal for 2015–20*, August 2014, pp. 71, 75–76. Refer to appendix D.5.2 for a full list of submissions supporting an equity beta point estimate lower than 0.7.

321 EMRF, *Submission to Jemena Gas Networks' access arrangement proposal for 2015–20*, August 2014, p. 85.

322 JGN, *Access arrangement information, Appendix 9.3: Return on equity proposal*, June 2014, pp. 32–33.

323 SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 84–85; SFG, *Equity beta*, May 2014, p. 4.

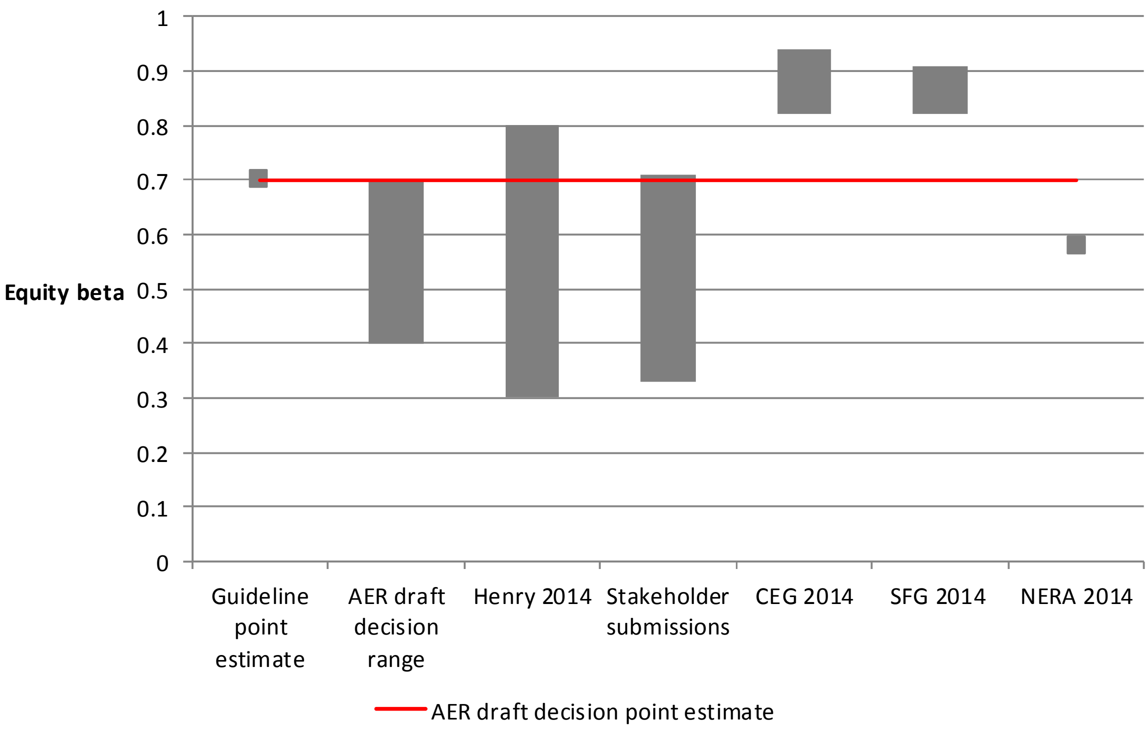
324 JGN, *Access arrangement information, Appendix 9.3: Return on equity proposal*, June 2014, pp. 40–41. The limitations JGN refers to are potential evidence of 'low beta bias' and a value premium, and contemporaneous evidence from SFG's construction of the DGM.

325 SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 94–96.

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

327 NGR, rule 87(2)(3); NGL, sections 23 and 24.

Figure 3-6 Comparison of the AER's equity beta range and point estimate with Henry's 2014 report and submissions



Source: AER analysis.[328]

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 Norske Skog Paper Mills' submission that we should adopt the median estimate presented in Henry's 2014 report. The upper bound is based on Origin's submission that we should not increase the equity beta above 0.71. The CEG 2014 range lower bound is equal to the SFG 2014 lower bound and its upper bound is based on DGM estimates. The SFG 2014 range lower bound is based on SFG's regression analysis of Australian and US firms and the upper bound is based on SFG's composite equity beta estimate proposed under its alternative 'foundation model' approach. The NERA 2014 point estimate is based on an equity beta of 0.58, which NERA used for its preferred specification of the SLCAPM.

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	2009–2014[(c)]	0.42–0.64			weekly/monthly return intervals, multiple estimation periods, OLS regressions, Bloomberg adjusted betas, raw estimates, 5

[328] Based on our draft decision and the following reports: AER, *Rate of return guideline*, December 2013, p. 15; Henry, *Estimating β: An update*, April 2014, p. 63; Norske Skog Paper Mills, *Submission to TransGrid's revenue proposal for 2014–19*, August 2014, p. 8; Origin, *Submission to ActewAGL's regulatory proposal for 2014–19*, August 2014, p. 4; CEG, *WACC estimates: A report for the NSW DNSPs*, May 2014, p. 7; NERA, *Return on capital of a regulated electricity network*, May 2014, p. 79. SFG proposes 0.82 in SFG, *Equity beta*, May 2014, p. 41 and 0.91 in SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 11.

2014					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 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.[329]

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

We now discuss the next step in our process. In one sense, this is the first part of step five. Under this step we look at the available estimates and values that the other information we consider plays a role in estimating the return on equity that contributes to achieving that allowed rate of return objective.

---

329 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.

Step four other information

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

Return on equity estimate derived from 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.[330]

Using the full beta range and data up to the 2013 calendar year end, return on equity estimates fall within a range of 6.2 to 10.1 per cent. Using only the beta point estimate from the top of the range, return on equity estimates fall within a range of 8.1 to 10.1 per cent.

We estimate this range using the following parameter estimates:

- a return on the market range of 10.1 to 12.8 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 based on an indicative 20 day averaging period of 17 September 2014 to 15 October 2014 of 3.55 per cent (see discussion on the risk free rate under step three above)

Table 3-19 sets out our estimates of historical returns on the market portfolio. These historical estimates assume that dividends are valued at 60 per cent of their face value. That is, these assume a theta of 0.6 ($\theta = 0.6$).

Table 3-19 Historical returns on the market portfolio when theta equals 0.6 (per cent)

Sampling period	Arithmetic mean (real)	Arithmetic mean (nominal)[a]
1883–2013	8.6	11. 3
1937–2013	7.4	10.1
1958–2013	9.0	11.7
1980–2013	10.1	12.8
1988–2013	9.4	12.2

Source: Handley, *An estimate of the historical equity risk premium for the period 1883 to 2011*, April 2012, p. 6. AER update for 2012–2013 market data.
Note: (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

JGN proposed an expected return on the market informed by SFG's estimation of the Wright approach.[331] We agree with the following aspects of SFG's Wright approach estimate:

- Using an indicative prevailing risk free rate averaged over 20 businesses days, consistent with the indicative risk free rate used in the SLCAPM. We will update this in accordance with the

330 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 26–27.
331 JGN, *2015–20 Access arrangement information*, 30 June 2014, pp. 30–31; SFG, *The required return on equity for regulated gas and electricity network businesses*, 6 June 2014, pp. 4–8; 55–60.

confidential averaging period agreed upon in advance (see the risk free rate section of step three).

- 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 because:[332]

- We apply an equity beta point estimate of 0.7 from a 0.4 to 0.7 range. However, since SFG only applied the Wright approach to estimate the return on the market, it used an effective beta of 1.0. Table 3-10 and table 3-14 set out why we use the Wright approach at the return on equity level.

- We do not apply NERA's (2013) adjustment.[333] As such, SFG proposed a different estimate of historical market returns to us.[334] 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 NERA estimated the return on equity under the Wright approach as a point estimate using the longest time period available. We estimate a range under the Wright approach from the different averaging periods in Table 3-19. This recognises the estimated return on the market will vary depending on the time period used.[335] 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 JGN 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 6.2 to 10.1 per cent using the full beta range. Using only the beta point estimate, the return on equity estimates fall within a range of 8.1 to 10.1 per cent.

Return on debt

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[336]

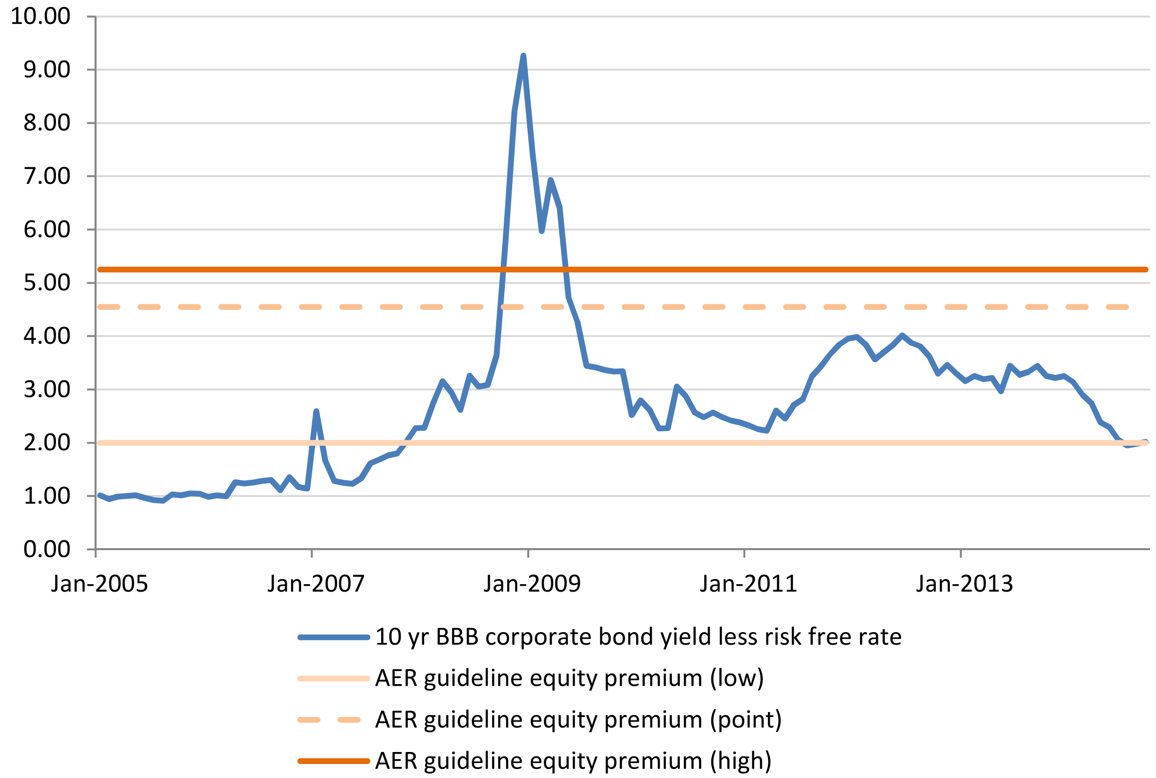
- JGN's proposed return on equity is likely to exceed efficient financing costs.

The current debt market has debt providing a premium over the risk free rate of 2.08 per cent.[337] 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 3-7 shows the current and historical debt risk premium and the AER's foundation model equity risk premium.

---

[332] SFG, *The required return on equity for regulated gas and electricity network businesses*, 6 June 2014, pp. 55–60.
[333] NERA, *The market, size and value premiums*, 2013.
[334] SFG, The required return on equity for regulated gas and electricity network businesses, June 2014, p. 59.
[335] AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 26–27.
[336] Efficient financing costs for a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of reference gas services.
[337] Based on the RBA's data (statistical table F3) for the 30 September 2014 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. We note that our benchmark return on debt is estimated by reference to BBB+ rated corporate bonds and makes use of both the RBA and Bloomberg corporate bond data.

Figure 3-7 Comparison of equity and debt premiums



Source: AER analysis, RBA F3 and F16 interest rates statistics

We do not consider that the current approximate 2.5 per cent difference between equity risk premium to CGS allowed in our draft decision and debt risk premiums to CGS (calculated as the extrapolated effective annual YTM on BBB[338] rated debt with 10 years to maturity less the effective annual YTM on CGS with 10 years to maturity) to be too low, on the basis of:

- the low risk nature of our benchmark entity as outlined above
- the current downward trend in the debt premium[339]
- 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[340]
- the need for caution in comparisons of debt and equity premiums, the lack of academic consensus on the relationship between debt and equity premiums, and the potential that an equity

338 BBB bond yields have been used instead of BBB+ because the RBA quotes BBB yields to maturity.

339 As noted by the Public Interest Advocacy Centre: "*The DNSPs have increased their proposals with respect to both the return on debt and the return on equity. The conclusion from this change is that the DNSPs believe their cost of capital has risen since the start of the year. In practice, interest rates have continued to decline, and the change is more a result of some further changes to the methodologies they are using to assess these costs.*" [PIAC, *Moving to a new paradigm: submission to the Australian Energy Regulator's NSW electricity distribution network price determination*, 8 August 2014, p. 67].

340 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 Graham Partington on behalf of the Securities Industry Research Centre of Asia Pacific (SIRCA) Limited, *Report to the AER: the relationship between the cost of debt and the cost of equity*, 14 March 2013, pp. 7, 21;.and 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.

premium of 4.55 per cent may be too high for the pre-GFC period rather than being too low for the post-GFC period.

TransGrid, through a report prepared by NERA, submitted that a comparison to the return on debt indicates that the equity risk premium proposed in our rate of return guideline was too low.[341] NERA also submitted that that the difference between debt and equity risk premiums for regulated businesses does not need to be adjusted for the difference between promised and expected returns. We disagree with NERA's arguments, and are of the view that our rationale set out above remains valid. Our response to NERA's report is in the return on equity appendix.

Return on equity estimates

We consider this as a class of information which includes independent valuation (expert) reports, estimates from broker reports and estimates from other regulator's decision.

Independent valuation (expert reports)

Table 3-20 outlines the independent valuation reports that could inform our overall return on equity estimate. We have focussed on those reports that include a return on equity for companies that provide the closest comparison to our benchmark efficient entity. However, we note that Table 3-20 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 have also focussed on the equity risk premium rather than the overall return on equity to isolate the businesses-specific risk premium from movements in the risk free rate.[342]

The directional evidence from these reports tends to suggest:

- Equity risk premium ranges from 3.3 per cent to 5.4 per cent (without adjustment for dividend imputation, 3.7 per cent to 6.2 per cent with imputation adjustment).[343] These values exclude discretionary uplifts applied by the valuer for a purpose inconsistent with our allowed rate of return objective (see section E2 in the return on equity appendix). 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. We consider that 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 of 4.55 per cent (which includes the effect of dividend imputation) is within the range of estimates from valuation reports.

- The AER's foundation model equity risk premium sits lower in the imputation adjusted range from valuation reports, but we note that we have concerns that the adjustment for dividend imputation may not be appropriate (as outlined in section E2 of the return on equity appendix). 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 of valuation reports.

341 NERA, *Return on Capital of a Regulated Electricity Network*, May 2014, pp. 114–118.

342 Note that the valuation reports show that 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 (ten 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.

343 The mid-points of the valuers equity risk premium estimates range from 3.6 to 5.1 (4.0 to 5.8 with imputation adjustment), as shown in Table 3-20.

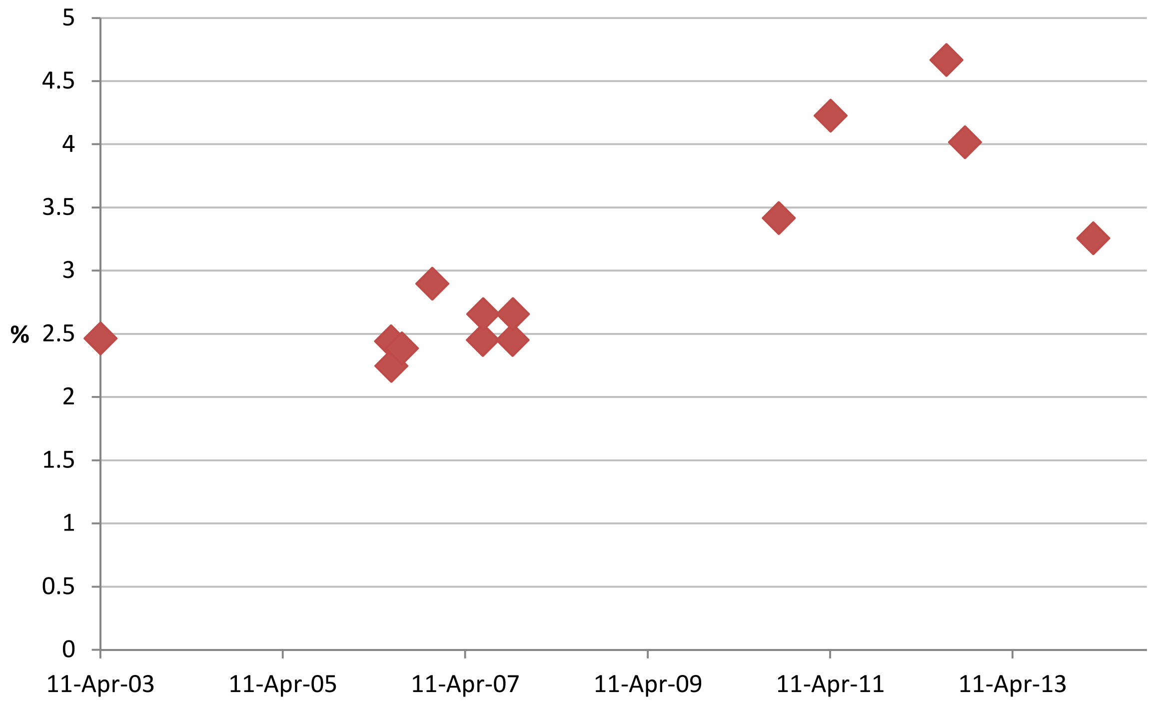
- The total risk premium above the risk free rate provided by the WACC estimates from the valuation reports ranges from 2.1 per cent to 4.8 per cent. Mid-points of the valuers' estimated total risk premium ranges are shown in Figure 3-8.[344] The total risk premium provided by our rate of return estimate of 6.80 per cent for JGN is approximately 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 from this draft 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 3-20 includes only 18 independent valuation reports spanning a period going back to 1991.[345] 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 3-8 Total risk premium from relevant expert reports over time



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 – see Table 3-20 for details.

---

[344] The range of 2.1 to 4.8 extends from the minimum lower bound to the maximum upper bound of the valuers' ranges.

[345] 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.

Table 3-20 Relevant independent valuation (expert) reports

Report date	Business	Valuer	Post-tax WACC[D]	Vanilla WACC[D]	Vanilla WACC premium over risk free rate	Return on equity[D]	Equity risk premium	Pre-tax debt risk premium	Equity beta	Return on equity (imputation adjusted)[A D]	Equity risk premium (imputation adjusted)
20/02/1998	Allgas Energy	Ernst & Young	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
19/03/1999	United Energy	SG Hambros	7.5[B]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
05/04/2003	GasNet	Sumner Hall	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
27/05/2003	United Energy	Deloitte	6.90	7.72	2.46	8.86	3.6	1.07	0.57	9.30	4.04
26/04/2006	AGL	Grant Samuel	6.88	8.19	2.39	10.9	5.1	0.9	0.85	11.60	5.80
19/06/2006	GasNet (regulated)	Lonergan Edwards	6.75	8.10	2.25	10.5	4.65	0.95	0.78	11.14	5.29
19/06/2006	GasNet (unregulated)	Lonergan Edwards	6.95	8.29	2.44	10.5	4.65	1.25	0.78	11.14	5.29
25/08/2006	Alinta Ltd	Grant Samuel	6.88	8.19	2.39	10.9	5.1	0.9	0.85	11.60	5.80
15/11/2006	Alinta Infrastructure Holdings	Grant Samuel	7.13	8.50	2.90	10.7	5.1	1.4	0.85	11.39	5.79
29/06/2007	Alinta Ltd (gas transmission)	Grant Samuel	7.13	8.66	2.66	11.1	5.1	1.0	0.85	11.74	5.74
29/06/2007	Alinta Ltd (gas & electricity distribution)	Grant Samuel	6.88	8.45	2.45	11.1	5.1	1.0	0.85	11.74	5.74
05/11/2007	SP AusNet (gas transmission)	Grant Samuel	7.13	8.76	2.66	11.2	5.1	1.0	0.85	11.78	5.68
05/11/2007	SP AusNet (gas & electricity distribution)	Grant Samuel	6.88	8.55	2.45	11.2	5.1	1.0	0.85	11.78	5.68
09/10/2009	Babcock & Brown Infrastructure Group (WA Gas Networks)	Grant Samuel	7.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
09/10/2009	Babcock & Brown Infrastructure Group (Tas Gas Pipeline)	Grant Samuel	7.25	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Report date	Business	Valuer	Post-tax WACC[D]	Vanilla WACC[D]	Vanilla WACC premium over risk free rate	Return on equity[D]	Equity risk premium	Pre-tax debt risk premium	Equity beta	Return on equity (imputation adjusted)[A D]	Equity risk premium (imputation adjusted)
09/10/2009	Babcock & Brown Infrastructure Group (WestNet Energy)	Grant Samuel	11.75	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
09/10/2009	Babcock & Brown Infrastructure Group (TasGas)	Grant Samuel	7.25	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
22/09/2010	Spark Infrastructure Group	Lonergan Edwards	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
24/09/2010	Prime Infrastructure Group (TasGas)	Grant Samuel	7.25	8.42	3.42	9.5	4.5	2.5	0.75	10.00	5.00
13/04/2011	Spark Infrastructure Group	Lonergan Edwards	9.10	9.73	4.23	10.3	4.8	2.5	0.80	10.90	5.40
03/08/2012	Hastings Diversified Utilities Fund [C]	Grant Samuel	6.54	7.67	4.67	7.8	4.8	4.5	0.8	8.52	5.52
03/10/2012	DUET Group [C]	Grant Samuel	7.02	7.02	4.02	7.8	4.8	3.2	0.8	8.54	5.54
31/05/2013	DUET Group	Grant Samuel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
04/03/2014	Envestra [C]	Grant Samuel	6.20	7.46	3.26	8.1	3.9	2.8	0.65	8.67	4.47

Source: AER analysis of reports from the Thomson Reuters Connect4 database

Notes: WACCs are nominal and, where relevant, values are the mid-point of the range estimated by the valuer.

A. Imputation adjustment was done by uplifting the market risk premium, consistent with our DGM adjustment.

B. SG Hambros used a discount rate of 10.2 per cent for the first year and 7.5 per cent thereafter.

C. Grant Samuel final post-tax WACC values for HDF, DUE, and ENV include discretionary uplifts applied by Grant Samuel. Post-tax WACC values (mid-points) including the uplifts are 8.25 per cent, 9.5 per cent, and 6.75 per cent for HDF, DUE, and ENV respectively.

D. These values exclude the uplifts explained in note C, for the reasons set out in step two.

Incenta Economic Consulting, in a report prepared for TransGrid, reviewed independent valuation reports recently released and submitted that:[346]

- many independent valuation reports include an uplift to the return on equity above the valuer's initial CAPM-based estimate
- uplifts above initial CAPM-based estimates are on average higher for low beta businesses.

We note that the return on equity and equity risk premium estimates contained in Table 3-20 are the final values used in the independent valuation report and reflect any uplifts applied (though, as noted in step two we have concerns about the applicability of these uplifts to our rate of return objective). We also have concerns about the small sample size of relevant reports, as stated above. We note that the correction of a handful of errors in Incenta Economic Consulting's initial analysis resulted in material reductions in the average uplift from the sample.[347] Further, as stated above, we consider that there is greater benefit in observing comparable businesses than all businesses with low betas.

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 supports our foundation model estimate, noting 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). This is consistent with 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.[348] Although we have concerns with the applicability of these uplifts to our rate of return objective, we note that the equity risk premium range in three of the four scenarios[349] is consistent with our foundation model premium of 4.55 per cent.
- 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.[350] Our foundation model estimate of 4.55 per cent lies within this range. We also note that the upper end of the range is likely over-stated, due to our concerns over adjusting for dividend imputation and the likelihood that some of the uplift should apply to the return on debt.[351]

---

346 Incenta Economic Consulting, *Evidence on return on equity from independent expert reports*, May 2014, p. 4. Incenta Economic Consulting, Memorandum amending *Evidence on return on equity from independent expert reports*, 20 August 2014, p. 1.

347 See: Incenta Economic Consulting, *Memorandum*, Addendum to report titled "Update of evidence on the required return on equity from independent expert reports", 20 August 2014.

348 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.

349 Without any adjustment for dividend imputation.

350 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.

351 NERA submitted that Grant Samuel's final estimate of 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. Based on Grant Samuel's reasons for its uplift, at least some portion should be applied to the return on debt. 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.

Broker reports

Table 3-21 shows the estimates of return on equity and premium above the risk free rate from broker reports between 20 August 2014 and 24 September 2014. As explained in step two we have focussed on those reports that include a return on equity for companies with non-diversifiable risks closest to those of our benchmark efficient entity. As noted above in relation to independent valuation reports, 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 have also focussed on the equity risk premium rather than the overall return on equity to isolate the businesses-specific risk premium from movements in the risk free rate.

Table 3-21 Recent broker reports

		Return on equity	Equity risk premium
Broker estimate - no imputation adjustment	Minimum	8.5	3.5
Broker estimate - no imputation adjustment	Maximum	9.9	4.9
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.[352]

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 premiums of TransGrid, ActewAGL (electricity distribution), and JGN are all above the range of premiums recently estimated by brokers. The equity risk premium proposed by the NSW DNSPs is within and towards the upper end of this range.[353]

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 during the Victorian gas access arrangement review. Our analysis during the Victorian gas access arrangement review examined broker reports from August 2012 to February 2013.

Directionally, the range of equity risk premium estimates from broker reports appears to have decreased since our review of broker reports during the Victorian gas access arrangement review, as shown in Table 3-22.[354] Note that our final decision for the Victorian access arrangement review included an equity risk premium of 4.8 per cent, based on a market risk premium estimate of 6 per cent and a beta estimate of 0.8.[355]

Table 3-22 Broker reports considered during the 2012 Victorian gas access arrangement review

		Return on equity	Equity risk premium

[352] Full references to the specific broker reports that we reviewed can be found in the return on equity appendix.

[353] The equity risk premiums proposed by TasNetworks (transmission) and Directlink are in line with our foundation model estimate.

[354] 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.

[355] 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 2, p. 96.

Broker estimate - no imputation adjustment	Minimum	8.7	4.0
Broker estimate - no imputation adjustment	Maximum	13.0	6.5
Broker estimate - adjusted for imputation	Minimum	9.7	4.7
Broker estimate - adjusted for imputation	Maximum	14.0	7.5

Source: AER analysis of broker reports by Credit Suisse, Goldman Sachs, JP Morgan, and Macquarie Bank that include a valuation for AusNet Services, Spark Infrastructure, APA Group, DUET Group, and/or Envestra Ltd.[356]

Other regulators

Table 3-23 shows the estimates of return on equity and premium above the risk free rate from other regulators' decisions between May 2013 and June 2014.[357] We have focussed on the equity risk premium rather than the overall return on equity to isolate the businesses-specific risk premium from movements in the risk free rate. As explained in step two we have put more reliance on those reports that include a return on equity for companies comparable to our benchmark efficient entity. This means that greater reliance is placed on Australian businesses over overseas businesses, and greater reliance is placed on electricity and gas network service providers over other types of regulated businesses.

Table 3-23 Return on equity estimates from recent decisions of other regulators'

Regulator	Decision	Date	Nominal vanilla return on equity	Equity risk premium
ERAWA	ATCO Gas – Draft decision	Oct 2014	6.80	3.85
ACCC	State Water – Final decision	Jun 2014	8.18	4.20
NTUC	PWC Networks – Final decision	Apr 2014	8.31	4.20
ESCV	Greater Metropolitan Water Businesses – Final decision	Jun 2013	6.98–7.67	3.90
IPART	Hunter Water Corporation – Final decision	Jun 2013	7.56–10.2	3.30–6.08
ESCOSA	SA Water – Final decision	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.
ESCV estimated a range for the real risk free rate and forecast inflation.

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

356 Full references to the specific broker reports that we reviewed can be found in the return on equity appendix.

357 Economic Regulatory Authority of Western Australia, *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; Australian Competition & Consumer Commission, *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; Essential Services Commission of Victoria, *Price review 2013: greater metropolitan water businesses: final decision*, 25 June 2013; Independent Pricing and Regulatory Tribunal, *Hunter Water Corporation's water sewerage stormwater drainage and other services – I July 2013 to 30 June 2017*, 11 June 2013; Essential Services Commission of South Australia, *Final determination statement of reasons*, State Water's water and sewerage revenues 2013/14 – 2015/16, 27 May 2013.

estimates from other regulators' decisions appears to have decreased since our review of other regulators' decisions during the Victorian gas access arrangement review, as shown in Table 3-24.[358]

Table 3-24 Return on equity estimates from other regulators' decisions considered during the 2012 Victorian gas access arrangement review

Regulator	Decision	Date	Nominal vanilla return on equity	Equity risk premium
ESCOSA	Advice on a regulatory rate of return for SA Water – Final decision	Feb 2012	8.59	4.80
QCA	SunWater – Final decision	May 2012	7.06	3.30
ESCV	V/Line Access Arrangement – Final Decision	Jun 2012	9.86	6.00
IPART	Sydney Catchment Authority – Final decision	Jun 2012	6.90–8.80	3.30-5.20
IPART	Sydney Water Corporation – Final decision	Jun 2012	6.90–8.80	3.30-5.20
ERA	Western Power – Final decision	Sep 2012	6.42	3.90
QCA	Seqwater - Draft decision	Dec 2012	5.85	3.30

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.

We note the CCP submitted a report that examined the rate of return on return on equity estimates of regulators in the United Kingdom and New Zealand.[359] We are also aware of the report by Economic Insights for the New Zealand Commerce Commission that compares rate of return estimates of regulators from Australia, New Zealand, the United Kingdom, the United States, and Europe.[360] As outlined in step two, there are difficulties in making international comparisons, and as such we have focussed our analysis on regulated Australian infrastructure.

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 achieving the allowed rate of return objective.

Step 5: 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 advances the allowed rate of return objective.[361] We are not (in principle) adverse to a multi model approach where the models are equally valid for the

[358] 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. 64–65.

[359] 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. 7–9.

[360] Economic Insights, *Regulatory precedents for setting the WACC within a range*, report prepared for New Zealand Commerce Commission, 16 June 2014.

[361] For example, we note that TransGrid's proposed multi-model approach involves three models that are reliant on SFG's DGM. McKenzie & Partington noted that any return on equity estimate could be obtained from SFG's DGM through judicious choice of input assumptions [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,, p. 35.]. As TransGrid's proposed SLCAPM and Black CAPM models rely on SFG's DGM, then all three models might be used to generate a return on equity estimate. .

intended objective.[362] However, given the limitations (as outlined in step two) of the other equity models proposed by the NSPs, we are of the view 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 parameters (Black CAPM and DGM).[363]
- 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 NSP's 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 the reliance they should be accorded. We disagree with the CCP that realised returns from transactions and financial statements would further the rate of return objective.[364]

Our foundation model return on equity estimate is 8.1 per cent, based on a prevailing risk free rate, a market risk premium estimate of 6.5 per cent, and an equity beta estimate of 0.7.[365] The estimate is calculated as follows:

$$8.1\% = 3.55\% + 0.7 * 6.5\%$$

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, in summary, 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. Since 2008, the TNSPs and DNSPs across the NEM have invested about $6.0 billion per annum in capex.[366]This suggests the allowances set in the past using the SLCAPM were at least adequate to recover efficient costs. This provides confidence that our estimate for this draft decision, whilst taking account of the downward trends in equity beta and current market conditions (for the risk free rate and MRP) is likely to provide the NSPs a reasonable opportunity to recover at least the efficient costs.[367]
- Our foundation model return on equity estimate is approximately 2.5 per cent above the prevailing yield to maturity (YTM) on 10 year maturity BBB debt. 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 our benchmark efficient entity with a similar degree of risk as TransGrid, we

362 As indicated by our approach to estimating the return on debt using a simple average of the RBA and Bloomberg yield to maturity (YTM) estimates extrapolated out to ten years.
363 We note that our specification of these models (particularly the DGM) may differ from that proposed by the NSPs.
364 For more information on how we determined the role of relevant material, see step two.
365 For more information on how we came to these estimates, see step three.
366 This is a high level estimate that does not include the gas networks that we regulate.
367 In using an equity beta of 0.7 and an MRP of 6.5 per cent, we have reduced the allowed ERP by 0.25 per cent relative to our recent regulatory decisions. Compared with the AER's previous decision for JGN, the allowed ERP is lower by 0.65 per cent. The previous decision adopted an MRP of 6.5 per cent and equity beta of 0.8.

would not expect the return on equity to be a long way above the prevailing return on debt.[368] 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 full beta range and data up to the 2013 calendar year end, Wright approach return on equity estimates range from 6.15 to 10.05 per cent. This results in an ERP range of 2.62 to 6.48 per cent. Using only the beta point estimate from the top of the range, return on equity estimates range from 8.10 to 10.05 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.[369]

- 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 (3.5 to 5.6 per cent), and other regulators (3.3 to 6.1 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 rate of return objective.

- Since we published the guideline, we received a new report by Henry, which sets out empirical equity beta estimates based on Australian energy network firms.[370] Some users consider the evidence from this report suggests we should adopt an equity beta point estimate below 0.7.[371] There are also some movements in the historical excess returns on the market and the MRP estimates derived by applying our DGM. Having considered the overall information and material before us, at this time we are not satisfied that this new information indicates a departure from the guideline would advance the allowed rate of return objective. We think the importance placed by all stakeholders on predictability and certainty of the guideline is important to achieving the allowed rate of return objective.

In summary, the information indicates that our equity risk premium of 4.55 per cent falls squarely within the range of other indicators available to inform the return on equity. Our task is to determine the efficient financing costs commensurate with the risk of providing regulated network service by an efficient benchmark entity.[372] 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 SLCAPM, this equals the MRP multiplied by the equity beta. We also considered the relative values of the equity risk premiums and the return on debt of our benchmark efficient entity. Figure 3-9 shows this comparison and our point estimate.

---

368 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.

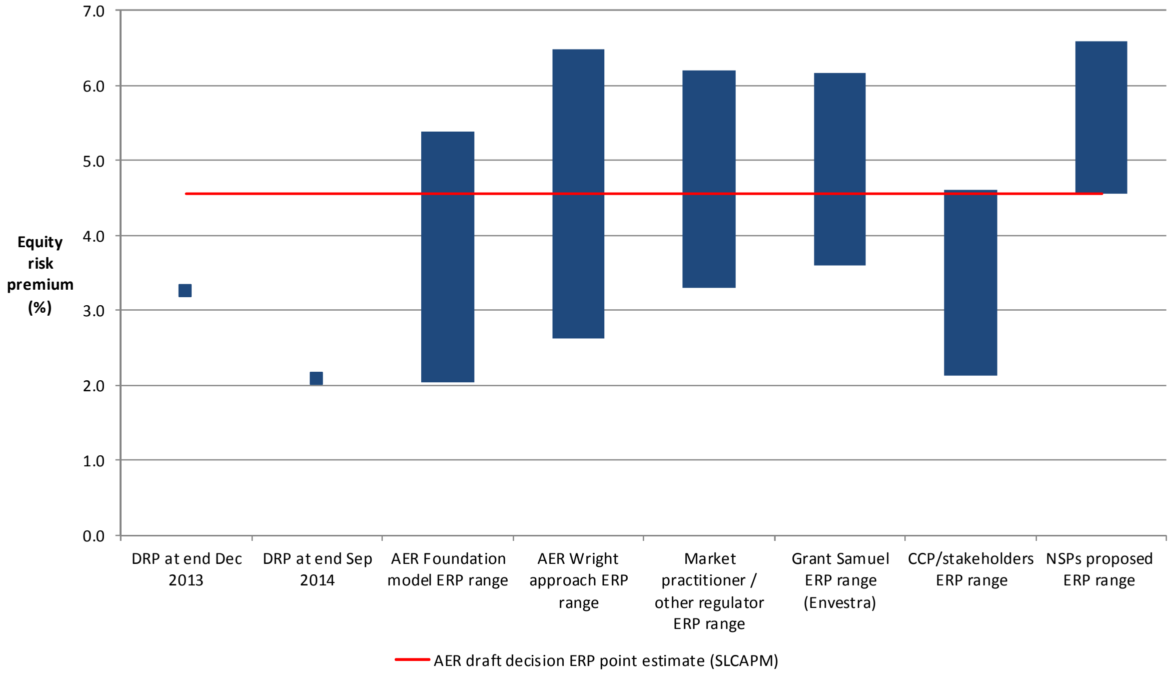
369 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 26–27.

370 Henry, *Estimating β: An update*, April 2014.

371 For example, see: UnitingCare, *Submission to ActewAGL's regulatory proposal for 2014–19*, September 2014, p. 20. More examples can be found in our discussion on equity beta in Step 3.

372 While there may be many various risks associated with providing gas reference 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.

Figure 3-9 Equity risk premium comparison



Source: AER analysis and various submissions and reports.

Notes: The AER's foundation model ERP range uses our draft decision equity beta range of 0.4 to 0.7 and MRP range of 5.1 to 7.8 per cent. The AER's foundation model point estimate uses our draft decision equity beta point estimate of 0.7 and MRP point estimate of 6.5 per cent.

The debt risk premiums (DRPs) are based on RBA data on the yield to maturity for BBB-rated non-financial corporate bonds with a 10 year term, specifically, the spread to 10 year CGS. These are not reflective of our draft decision return on debt estimate which is calculated as an average of the RBA and Bloomberg (BVAL) data series. We have also made an extrapolation adjustment to the RBA data series.

The Wright approach range is based on an equity beta range of 0.4 to 0.7; a return on the market range of 10.1 to 12.8 per cent; and a risk free rate of 3.55 per cent.

The other market practitioner ERP range is based on the range of return on equity (and ERP) estimates presented in the valuation reports, broker reports and other regulators' decisions we have considered. When ranges are presented in these reports, the full range is considered instead of taking the mid–point of the range.

Grant Samuel applied an uplift to its final WACC estimate for Envestra and it is difficult to determine how much of the uplift is attributable to the return on equity. Grant Samuel also did not include a gamma adjustment for the MRP. Therefore, the lower bound of the Grant Samuel ERP range is its initial lower bound return on equity estimate (no uplift, no gamma adjustment). The upper bound of the Grant Samuel ERP range is based on its initial upper bound return on equity estimate. The entire WACC uplift is applied to this return on equity estimate and we applied a gamma uplift. The upper bound of the Grant Samuel ERP range shows the most extreme case (where the entire WACC uplift is attributed to return on equity). See: Grant Samuel, *Envestra: Financial services guide and independent expert's report*, March 2014, Appendix 3.

The CCP/stakeholder ERP range is based on the CCP's advice and stakeholder submissions we received (not including service providers). The lower bound is based on UnitingCare's submissions. UnitingCare proposed an equity beta of 0.4 and MRP of 5.3 per cent (at the low end of the Guideline ranges). The upper bound is based on Origin's submission on ActewAGL's proposal. Origin proposed maximum estimates of 0.71 for the equity beta and 6.5 per cent for the MRP. See: UnitingCare, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, September 2014, pp. 19–20; UnitingCare, *Submission to ActewAGL's regulatory proposal for 2014–19*, September 2014, pp. 19–20; Origin Energy, *Submission to ActewAGL's regulatory proposal for 2014–19,* August 2014, p. 4.

The NSPs' ERP range incorporates the different approaches proposed by the NSPs. The lower bound is based on TasNetworks' proposal, which adopts the Guideline return on equity approach and parameter values. The upper bound is based on ActewAGL's and JGN's proposals, which derive the same return on equity estimate (10.71 per cent) from two alternative approaches (multiple model approach and alternative 'foundation model' approach). We calculate the ERP by subtracting their prevailing risk free rate from their return on equity estimate (10.71 – 4.12 = 6.59). See: TasNetworks, *Revenue proposal*, May 2014, p. 108; SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 10–11.

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 achieving the allowed rate of return objective.

Step 6: 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 ERP estimate should be uplifted or downshifted to better achieve 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 8.1 per cent derived from our implementation of the SLCAPM will contribute to achieving the allowed rate of return objective. We are also satisfied that this estimate is consistent with prevailing market conditions.

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 draft decision is to adopt a return on debt of 5.93 per cent, subject to updating, rather than the 7.30 per cent proposed by JGN. This return on debt will apply to JGN 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 draft 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 draft 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 access arrangement 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 draft 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.[373]

The above positions are consistent with the return on debt approach and implementation we proposed in the rate of return guideline (the Guideline).[374] Accordingly, our draft decision is to maintain the return on debt methodology we proposed in the Guideline.

In the Guideline, we proposed to use one or more third party data series to estimate of the return on debt.[375] 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 draft decision is to use a simple average of:

- the RBA broad-BBB rated 10 year curve (the RBA curve),[376] 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[377]

Further, our draft 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 JGN's averaging periods.[378]

In our current draft decisions, the issue of whether or not transitional arrangements are applied is a material and contentious issue.

The position of service providers on transitional arrangements was mixed.[379] JGN and TasNetworks proposed transitional arrangements consistent with the rate of return guideline. We agree with that component of those proposals. TransGrid, AusGrid, Endeavour Energy, Essential Energy, Directlink and ActewAGL proposed an immediate adoption of the trailing average portfolio approach (i.e. no transitional arrangements), which is a departure from the rate of return guideline. We disagree with that component of those proposals.

We estimate the allowed return on debt of a benchmark efficient entity, rather than estimate the actual return on debt of any particular service provider. Our draft 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

---

373 AER, *Rate of return guideline*, December 2013, pp.21-22; AER, *Explanatory statement—Rate of return guideline*, December 2013, p.126.

374 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.

375 AER, *Explanatory statement—Rate of return guideline*, December 2013, pp. 23–24.

376 The RBA refers to this curve as 'Non-financial corporate BBB-rated bonds'.

377 The Bloomberg ticker for this curve is: BVCSAB07.

378 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.

379 Ausgrid, *Regulatory proposal*, May 2014, pp. 70–71; Endeavour Energy, *Regulatory proposal*, May 2014, pp. 104–107, Essential Energy, *Regulatory proposal*, May 2014, pp. 90–92; TransGrid, *Regulatory proposal*, May 2014, pp. 178–179; ActewAGL, *Regulatory proposal*, 2 June 2014 (resubmitted 10 July 2014), pp. 276–282; JGN, *Access arrangement information*, 30 June 2014, pp. 96–9; TasNetwork (Transend), *Regulatory proposal*, May 2014, pp. 107–108.

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 JGN, other service providers with current proposals, and consumer representatives on the return on debt. In appendix G we provide further supporting material for these positions and we also respond to the issues raised by stakeholders in more detail. Finally, in appendix I, we assess JGN's proposed averaging periods to estimate the return on debt.[380]

For the reasons set out in this attachment, appendix G and appendix I, we are satisfied that our draft 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 JGN 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 gas objective and the revenue and pricing principles, including providing JGN 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 decision.

Rule requirements for return on debt

The rules 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.[381] The allowed rate of return objective is that the rate of return for the 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.[382]

The return on debt may be estimated using a methodology which results in either:

- the return on debt for each regulatory year in the access arrangement period being the same, or

---

380 Appendix I is confidential. Consistent with our standard practice, we will kept the service provider's averaging periods confidential until they expire.

381 NER, r.6.5.2(h) and r.6A.6.2(h); NGR, r.87(8).

382 NER, r.6.5.2(c) and r.6A.6.2(c); NGR, r.87(3).

- the return on debt being, or potentially being, different for different regulatory years in the access arrangement period.[383]

Our draft decision on the return on debt methodology is one which results in the return on debt being, or potentially being, different for different regulatory years. This is also the case with the return on debt methodology proposed by all service providers with current regulatory proposals.

The rules state that, subject to the rate of return objective, the methodology 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 decision for the access arrangement 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 access arrangement period
- some combination of the above.[384]

The rules require that we must have regard to the following factors in estimating the return on debt:[385]

- 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 incentives that the return on debt may provide in relation to capital expenditure over the access arrangement period, including as to the timing of any capital expenditure.
- Any impacts (including in relation to the costs of servicing debt across the access arrangement 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 access arrangement period to the next.

We interpret the first factor as meaning the difference between the return on debt set by the AER (which we refer to as the *allowed* return on debt) and the return on debt incurred by a benchmark efficient entity (which we refer to as the *actual* return on debt).

The last factor is particularly relevant to the current decisions as both our draft decision methodology, and the methodology proposed by service providers, are a change from the return on debt methodology used to estimate the return on debt in the previous access arrangement period.[386]

In its final rule determination, the AEMC stated that the purpose of this factor is:

> The purpose… 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

[383] NER, r.6.5.2(i) and r.6A.6.2(i); NGR, r.87(9).
[384] NGR, r.87(10).
[385] NER r.6.5.2(k) and r.6A.6.2(k) and NGR, r.87(11)
[386] Our previous decision for Ausgrid, Essential Energy, Endeavour Energy, ActewAGL and Transgrid covered the regulatory control period 2009–14; for Directlink, 2006–2015; and for JGN, 2010–15 access arrangement period.

> 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.[387]

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.[388]

Also, the rules require that if the return on debt is to be estimated using a methodology which results in the return on debt being, or potentially being, different for different regulatory years, then a resulting change to the service provider's regulated revenue must be effected through the automatic application of a formula that is specified in the decision.[389]

Return on debt—Approach

The following sections set out our considerations on the approach issues associated with estimating the return on debt. These issues are:

- the possible debt financing strategies that may be available to the benchmark efficient entity, and the possible approaches the regulator could adopt to estimate the allowed return on debt
- our choice of regulatory approach to estimate the allowed return on debt, choosing between the 'on-the-day', 'trailing average portfolio' and 'hybrid' approaches
- in adopting a trailing average portfolio approach, whether the allowed return on debt should be updated annually or held constant for the length of the access arrangement period
- in adopting a trailing average portfolio approach, whether the historical average should weight the prevailing return on debt from each year equally
- how the trailing average portfolio approach should be applied to new debt issued after the introduction of the new regulatory approach
- how the trailing average portfolio approach should be applied to existing debt and the transitional arrangements associated with applying a new regulatory approach to debt that was issued in the past

Possible debt financing strategies and regulatory approaches

The allowed rate of return objective refers to the efficient financing costs of a benchmark efficient entity. We consider the efficient debt financing costs of a benchmark efficient entity as those which are expected to minimise its debt financing costs over the life of its assets, while managing refinancing risk and interest rate risk. Those risks can be defined as:

- Refinancing risk—is the risk that the benchmark efficient entity would not be able to efficiently finance its debt at a given point in time. This may be because the debt instruments that it seeks are not available to it, or because they are expensive.
- Interest rate risk—is the risk resulting from a potential mismatch between the allowed return on debt and the actual return on debt of a benchmark efficient entity.

---

387 AEMC, *Final rule change determination*, 29 November 2012, p.85.
388 AEMC, *Final rule change determination*, 29 November 2012, p.85.
389 NGR, r.87(12).

We consider that in estimating the efficient debt financing *costs* of a benchmark efficient entity, it can be useful to consider the efficient debt financing *practices* of a benchmark efficient entity. By extension, efficient debt financing costs result from efficient debt financing practices.

Lally advises that, generally, there are three possible financing strategies that a firm could pursue. It could:[390]

- refinance all its debt at the same point in time
- borrow long term (e.g. 10 years) and stagger the borrowing so that only a small proportion of the debt matured each year, or
- borrow long term (e.g. 10 years) and stagger the borrowing so that only a small proportion of the debt matured each year, and enter interest rate swap contracts to change the effective term of the risk free rate component of the return on debt.[391]

There are also, generally, three possible regulatory approaches to estimate the return on debt. These are the:

- 'on-the-day' approach—this approaches estimates the allowed return on debt based on the prevailing rate at a particular point in time
- 'trailing average portfolio approach'—this approaches estimates the allowed return on debt based on the rates over a historical trailing average
- 'hybrid approach'—this approach is a combination of the two above approaches. This risk free rate component of the allowed return on debt is estimated based on the prevailing rate at a particular point in time. And the debt risk premium (DRP) component is estimated based on the rates over a historical trailing average.

Choice of on-the-day, trailing average portfolio or hybrid portfolio approach

There are strengths and weaknesses with each of the three general regulatory approaches. However, on balance, we are satisfied that the trailing average portfolio approach is preferable because it would result in a return on debt that better contributes to the achievement of the allowed rate of return objective. This conclusion is based on our assessment of these approaches as set out in the explanatory statement to the Guideline.[392] Also, stakeholders' submissions to the current decision processes and the Guideline development process supported the trailing average approach.

We consider that the on-the-day approach is also a reasonable approach. We are satisfied it was reasonable in the past and remains a reasonable approach. Other regulators continue to adopt it in some form (IPART, ESC, QCA and ERA).[393] In his advice to QCA, Lally stated that he considers there is no strong case for departing from the on-the-day approach.[394]

---

390 Lally, M., *The trailing average cost of debt*, March 2014, pp.13–14.

391 Lally also notes a fourth possible financing strategy. This is a firm could borrow long term (e.g. 10 years) and stagger the borrowing so that only a small proportion of the debt matured each year, enter interest rate swap contracts to change the effective term of the risk free rate component of the return on debt, and enter credit default swap contracts to change the effective term of the debt risk premium component of the return on debt. However, Lally advised that credit default swaps are not widely available to match the applicable debt instruments. Accordingly, this strategy is not considered further in this decision.

392 AER, *Rate of return guideline*, December 2013, pp.24–32.

393 For example, QCA proposed to maintain the on-the-day approach with five year term for the risk free rate component and 10 year term for DRP. For more details, see: QCA, *Trailing average cost of debt: draft decision*, 24 August 2014, p.24. On the other hand, the ERA retained a form of the the 'on-the-day' approach but with annual updates to the debt risk

A summary of our assessment of these three approaches against the rate of return criteria in the Guideline is set out below in Table 3-25. On balance, we consider the trailing average approach best meets those criteria.

The first criteria in the Guideline is that the rate of return is, where applicable, reflective of economic and finance principles and market information. The NPV principle (or present value principle) is a fundamental principle of economic regulation. The NPV principle is that the expected present value of a benchmark efficient entity's regulated revenue should reflect the expected present value of its expenditure, plus or minus any efficiency incentive rewards or penalties. In other words, departures from cost recovery are acceptable, so long as they are the result of management induced efficiencies or inefficiencies, rather than windfall gains or losses. The use of the present value principle is supported by Lally.[395] The building block model set out in the rules is based on this principle.[396] We also consider analysis of the NPV principle is useful to inform whether a particular regulatory approach would provide a service provider with a reasonable opportunity to recover at least its efficient costs. This is one of the revenue and pricing principles in the law. Lally advised that the NPV principle and this revenue and pricing principle are 'equivalent'.[397]

We used the NPV principle to assess the three approaches.[398] Both the trailing average and hybrid approaches would largely satisfy this principle (so long as moving to those approaches includes transitional arrangements). The on-the-day approach would also largely satisfy the NPV principle over the life of the assets but may result in over or under compensation in an individual access arrangement period.

However, the on-the-day and hybrid approaches may result in over compensation, on average, over the life of the assets, if a 10 year term is used for both the risk free rate and debt risk premium components of the return on debt. This would not occur if a 5 year term is adopted for the risk free rate component.[399]

Putting aside considerations on the term, each of these three approaches (if applied consistently over the life of the assets), would be expected to result in a similar average return on debt (over the life of the assets). Accordingly, so long as the same approach is applied over time, the choice of approach may not have a material effect on the average level of prices. However, the choice is likely to have a material effect on the volatility of prices over time. In order of least-to-most volatility, this would be the trailing average portfolio approach, the hybrid approach, then the on-the-day approach.

---

premium component of the total cost of debt. It also applies five year debt term. Economic Regulation Authority (ERA) Western Australia, *On the benchmark cost of debt: efficiency considerations*, June 2013.

394 Lally, M., *The trailing average cost of debt*, 19 March 2014, p.51.

395 Lally, M., *The risk free rate and the present value principle*, 22 August 2012, p.6.

396 We explain the legislative origins of the connection between the rules, the building block model, and the present value principle in appendix G.

397 Lally, *The risk free rate and the present value principle*, 22 August, 2012.

398 Lally advised that the NPV principle should be viewed as a compatible combination of regulatory policy and service providers' actions that satisfy the NPV principle. For more details on the NPV principle in respect of the return on debt, see: Lally, M., *Trailing average cost of debt*, 19 March 2014, pp.8–9; and Lally, *Transitional arrangements for the cost of debt*, November 2014, pp. 22-25. For more details on the NPV principle and building block framework, more generally, see Biggar, D., *Public utility regulation in Australia: Where have we got to? Where should we be going? Working paper no. 4*, ACCC/AER working paper series, July 2011, p.58; Biggar, D., *Incentive regulation and the building block model*, 28 May 2004; Lally, *The risk free rate and the present value principle*, August 2012; and Lally, *The present value principle: risk, inflation and interpretation*, 4 March 2013.

399 Regulatory Economic Unit (REU)(formerly Regulatory Development Branch), *Estimating the cost of debt: a possible way forward*, April 2013, pp.5–6; Lally, M., *The trailing average cost of debt*, 19 March 2014, pp.45–46. The overcompensation, on average, over the life of the assets is the result of using a 10 year term for the total return on debt, whereas, because of hedging arrangements, the effective of term of the risk free rate would be less than this. The QCA's application of the on-the-day approach, of adopting a 5 year risk free rate and 10 year debt risk premium, would not be expected to result in over compensation over the life of the assets.

Reducing price volatility is one of the considerations in the Guideline that led us to adopting the trailing average portfolio approach.[400] However, we are also conscience that switching from the on-the-day approach to the trailing averaging portfolio approach may have an impact of the average level of prices faced by consumers. This is one of our reasons for adopting transitional arrangements. As discussed later in this attachment, we consider transitioning from the on-the-day approach to the trailing average portfolio approach, rather than adopting the new approach immediately, may be expected to maintain the same average level of prices while reducing price volatility over time.

---

[400] AER, *Explanatory statement—Rate of return guideline*, December 2013, pp.109-110.

Table 3-25 Summary of our assessment of the three main regulatory approaches to the return on debt

Rate of return criteria	Current 'on-the-day' approach	Trailing average portfolio approach (applied to the total cost of debt)	Hybrid approach (On-the day approach applied to the risk free rate, and trailing average portfolio approach applied to the debt risk premium)
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	This approach would satisfy the NPV principle over the life of the assets, but may depart from the NPV principle in an individual access arrangement period.[401]	This approach would satisfy the NPV principle over the life of the assets and in each access arrangement period.[402] The debt strategy for the trailing average is staggered borrowing with no interest rate swap activity.	This approach would satisfy the NPV principle over the life of the assets and in each access arrangement period.[403] The debt strategy is staggered borrowing combined with interest rate swaps to reduce the effective term of the risk free rate component and match the costs of the risk free rate component to the allowed return on debt.
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; - promote simple over complex approaches where appropriate.	Relatively simple and easy to implement	This approach is easier to understand and implement than the hybrid approach. There are transitional issues to address in implementation, which can be complex. It would result in increased complexity relative to the on-the-day approach, mainly due to the need to annually update the allowed return on debt and the type of weighting applied, which can be complex. Though our draft decision is to use equal weighting (simple averaging) which reduces the potential complexity.	This approach is more complex to understand than the other two approaches. It would result in increased complexity relative to the on-the-day approach, mainly due to the need to annually update the return on debt and the type of weighting applied, wwhich can be complex.
Implemented in accordance with good practice:	Estimation procedure is transparent and can be replicated using available data	The estimation procedure is transparent and can be replicated using available data	The estimation procedure is transparent and can be replicated using available data

401 Lally, M., *The trailing average cost of debt*, 19 March 2014, pp.8–15, and p.45; REU, *Estimating the cost of debt: a possible way forward*, April 2013, pp.4–7. Lally advised that there are two versions of the present value principle. The first version being to satisfied the present value principle each access arrangement period, and the second version being to satisfy the present value principle over the full life of the regulated assets. He advised that 'I agree that these two versions of the Present Value principle exist, with the first version merely being that one used by the regulator to operationalise the second version. I also agree that the second version is more fundamental, and therefore more important.' Lally, *The present value principle: Risk, inflation and interpretation*, 4 March 2013, p.13.

402 Lally, M., *The trailing average cost of debt*, 19 March 2014, pp.13–15.

403 Lally, M., *The trailing average cost of debt*, 19 March 2014, pp.13–15.

- supported by robust, transparent and replicable analysis that is derived from available, credible datasets.		It becomes more difficult to implement without transitional arrangements due to practical issues with the use of historical data.	It becomes more difficult to implement without transitional arrangements due to practical issues with the use of historical data.
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 outcome may be sensitive to the choice of averaging period.	The outcome is relatively less sensitive to the choice of averaging period relative to the on-the-day approach.	The outcome on the debt risk premium is relatively less sensitive to the choice of averaging period relative to the trailing average approach.
Where market data and other information is used, this information is: - credible and verifiable - comparable and timely - clearly sourced	This approach is based on data that is available, comparable and that can be clearly sourced.	This approach is based on data that is available, comparable and that can be clearly sourced. Though the need to update the return on debt via the automatic application of a formula specified in the decision requires consideration of a range of ‘contingencies’ specified upfront if the intended data source and method of estimating the return on debt is no longer available or possible during the access arrangement period.	This approach is based on data that is available, comparable and that can be clearly sourced. Though the need to update the return on debt via the automatic application of a formula specified in the decision requires consideration of a range of ‘contingencies’ specified upfront if the intended data source and method of estimating the return on debt is no longer available or possible during the access arrangement period.
Sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.	Changing market conditions are reflected are the start of, but not during, the access arrangement period	Reflects a historical average of the return on debt, rather than the prevailing return on debt. Changing market conditions are partially reflected annually in the updated allowed return on debt.	Reflects a historical average of the debt risk premium, rather than the prevailing debt risk premium. Changing market conditions on the debt risk premium are partially reflected annually in the updated allowed return on debt. Changing market conditions on the risk free rate are reflected are the start of, but not during, the access arrangement period

Source: AER analysis

Annual updates

Our draft decision is to annually update the return on debt. This is consistent with the approach we proposed in the Guideline.

All service providers with current regulatory proposals also proposed to annually update the return on debt. We agree with this component of those proposals.

We have decided to annually update the return on debt for the reasons set out in the explanatory statement to the Guideline.[404] This includes reducing the potential mismatch between the actual and allowed return on debt of the benchmark efficient entity. In addition, we note that a desirable feature of annually updating the return on debt is that it reduces the volatility of prices between access arrangement periods (by introducing a small degree of price volatility within the access arrangement period). We note that 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.[405]

As set out in the explanatory statement to the Guideline, we acknowledge that the implementation of annual updating would be moderately complex. The rules[406] require the change in revenue from the annual debt update to be effected through the automatic application of formula that is specified in service providers' determination.[407] To address this matter we have:

- proposed 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.
- released for consultation an amended PTRM to that provides enough flexibility to implement the return on debt approach in this decision (or other potential approaches).

As set out in the explanatory statement to the Guideline, we consider that on balance, the advantages of annual updating outweigh the associated additional resource requirement and other potential disadvantages, such as potentially higher volatility of consumer prices within an access arrangement period.[408]

Later in this attachment, in the annual debt update process, we set out our draft decision on the process by which the return on debt will be updated annually.

Weighting

Our draft decision is to adopt an equally (i.e. simple) weighted trailing average portfolio approach to estimate the return on debt. This is consistent with the approach we proposed in the Guideline.

---

404 AER*, Explanatory statement—Rate of return guideline*, December 2013, pp.111–115.

405 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.

406 NER, r.[6.5.2(l) and 6A.6.2(l); NGR 87(12)

407 AER*, Explanatory statement—Rate of return guideline*, December 2013, p.115

408 AER*, Explanatory statement—Rate of return guideline*, December 2013, pp.111–115.

All service providers with current regulatory proposals also proposed to adopt an equally weighted approach.[409] We agree with this component of those proposals.

We have decided to equally weight the trailing average portfolio for the reasons set out in the explanatory statement to the Guideline.[410]

Application to new debt

The on-the-day approach was applied in previous regulatory decisions. However, our draft decision is to adopt the trailing average portfolio approach in this decision. The rules require us to consider any impacts on the benchmark efficient entity that could arise as a result of changing the methodology that is used to estimate the return on debt from one access arrangement period to the next. The potential impacts that are relevant include any impact on the benchmark efficient entity in relation to the costs of serving debt across access arrangement periods.[411]

We are satisfied that an efficient strategy for a benchmark efficient entity under either the on-the-day or trailing average approach would be to hold a staggered portfolio of long term (10 year) debt. There is agreement between us and service providers on this point.[412] A staggered debt portfolio means that 10 per cent of the debt is new or refinanced each year. This means that for the 2015-20 access arrangement period, the benchmark efficient entity will be issuing new debt each year. It also means that at the start of that period, the benchmark efficient entity would have in place a portfolio of existing debt. We have separately considered the appropriate regulatory approach for the new debt and the existing debt of a benchmark efficient entity.

Our draft decision is to build up the trailing average approach over time by applying it to all new debt. This could be viewed as adopting an immediate application of the trailing average approach to new debt. We consider that all new debt will be issued under the new regulatory regime and that regime should apply to setting the benchmark efficient entity's return on debt for that new debt. Under the new trailing average portfolio approach, an efficient strategy for the benchmark efficient entity would be to have a staggered portfolio of fixed rate debt. Building up the trailing average portfolio approach by incorporating new debt into it when issued would reduce the potential mismatch between the allowed and actual return on debt of the benchmark efficient entity, with respect to that new debt. It therefore is also commensurate with the efficient debt financing costs of the benchmark efficient entity.

In summary, the new regulatory regime applies to new debt. However, at the start of the 2015–20 access arrangement period the benchmark efficient entity would also have a portfolio of existing financial arrangements there were organised under the old regime, which was the on-the-day approach. In organising those financial arrangements, the benchmark efficient entity may have expected the on-the-day approach to continue to apply in future access arrangement periods. This raises a key question about how to commence the trailing average approach, and whether transitional arrangement will contribute to the achievement of the rate of return objective. We discuss the issue of transitional arrangements in the next section.

---

409 Ausgrid, *Regulatory proposal*, May 2014, pp. 70–71; Endeavour Energy, *Regulatory proposal*, May 2014, pp. 104–105, 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; Directlink, Regulatory revenue (subsequent) proposal, July 2014, pp.37–38.

410 AER*, Explanatory statement—Rate of return guideline*, December 2013, pp.115–116

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

412 However, under the on-the-day approach, we consider the benchmark efficient entity would issue floating rate debt (or fixed rate debt which is converted to floating rate debt through the use of interest rate swaps). Whereas the NSW service providers consider the benchmark efficient entity with a similar degree of risk to them would have issued fixed rate debt. However, this does not change the timing of when this debt would mature, which is in agreement.

Application to existing debt—Transitional arrangements

Our draft decision is to apply transitional arrangements to the existing debt portfolio of the benchmark efficient entity. These transitional arrangements apply until that existing debt portfolio fully matures, meaning the transition period is 10 years. This is consistent with the approach we proposed in the Guideline.

We are satisfied that starting the trailing average by employing transitional arrangements is consistent with the requirements of the rules.[413] Under our transitional arrangements, the allowed return on debt for debt that existed at the start of the 2015–20 access arrangement period is set in a manner similar to the previous on-the-day approach. Accordingly, the impact on the benchmark efficient entity is not, in principle, different to the impact on the benchmark efficient entity if we had continued to adopt the on-the-day approach.[414] This means that the impact on the benchmark efficient entity from changing the return on debt methodology from one access arrangement period to the next is minimal.

The chosen risk strategies that service providers adopted in the past in relation to their financing arrangements are therefore left to run to their natural conclusion and they will keep any benefits or wear any detriments that flow from those choices.

Commencing the trailing average with a period of transition contributes towards the achievement of the rate of return objective because it minimises the potential mismatch between the allowed and actual return on debt of the benchmark efficient entity, while also avoiding windfall gains or losses to service providers or consumers from changing the regulatory approach to the return on debt. For these reasons, it also provides service providers with a reasonable opportunity to recover at least their efficient debt financing costs.

We adopt the same transitional arrangements for both the risk free rate and debt risk premium components of the return on debt. However, our reasons for adopting transitional arrangements differ for these two components.

We have adopted a transition on the risk free rate component because a transition minimises the potential mismatch between the allowed return on debt and the actual return on debt of the benchmark efficient entity, as it transitions its financing practices. The benchmark term of debt is 10 years. It would therefore take 10 years before all of the existing debt of the benchmark efficient entity matured, and its financing practices are fully transitioned. Accordingly, this reason for the transition on the risk free rate component also informs our draft decision on the length of the transition period, which is 10 years.

We have adopted a transition on the debt risk premium component of the return on debt because a transition:

- Avoids potential windfall gains or losses to service providers or consumers from changing the regulatory regime
- Avoids practical problems with the use of historical data

We have also adopted a transition on both the risk free rate and debt risk premium components because a transition:

413 NER, rule 6.5.2 (k)(4); rule 6A.6.2(k)(4); NGR, r.87(11).
414 Lally, *Transitional arrangements for the cost of debt*, November 2014, p.29.

- Maintains the same average price level while decreasing price volatility over time
- Reduces the potential for opportunistic behaviour from stakeholders

Further, adopting the same transitional arrangements for all service providers is consistent with our adoption of a single benchmark efficient entity definition. These reasons are discussed in the following sections.

Minimises the potential mismatch between the allowed return on debt and the actual return on debt of the benchmark efficient entity as it transitions its financing practices

In relation to the risk free rate component of the return on debt, we are satisfied that transitional arrangements minimise the potential mismatch between the allowed return on debt and the actual return on debt of a benchmark efficient entity, as it transitions its financing practices in line with the new regulatory approach.

The on-the-day approach was a regulatory approach we sort to implement in past regulatory decisions to set the allowed return on debt.[415] It was designed to match the allowed return on debt to prevailing market conditions in the market for funds at the start of each access arrangement period. However, it was not designed to match the costs of any particular viable financing practice for the benchmark efficient entity. There is agreement between the AER and service providers that seeking to refinance all debt during the averaging period used for the on-the-day approach would have resulted in the benchmark efficient entity facing a high level of refinancing risk.[416]

Moreover, the financing costs under such a financing strategy would not have matched the allowed return on debt, at any rate. This is because the on-the-day approach we applied was based on the prevailing 10 year return on debt, but this rate was reset every access arrangement period (typically, every five years), rather than reset every 10 years to match the benchmark debt term. CEG also made this point.[417] One of the factors we must have regard to in estimating the return on debt is any impacts (including in relation to the costs of servicing debt across the access arrangement periods) on a benchmark efficient entity that could arise as a result of changing the return on debt methodology from one access arrangement period to the next. The on-the-day approach did not match any particular viable financing practice for the benchmark efficient entity. Accordingly, in order to understand the impact of changing the debt methodology on the benchmark efficient entity, we have investigated the strategies the benchmark efficient entity could have employed to efficiently finance itself under the previous on-the-day approach.

We consider an efficient financing practice of the benchmark efficient entity under the on-the-day approach would have been to borrow long term and stagger the borrowing so that only a small proportion of the debt matured each year. We consider the benchmark efficient entity would have

---

415 The on-the-day approach was the regulatory approach that we sort to implement in past regulatory decisions. Part of the on-the-day approach was using an averaging period to estimate the return on debt as close as practically possible to the commencement of the regulatory control period. We note that for the 2009–14 regulatory control period, the on-the-day approach applied to the NSW service providers in a modified form, as a result of the Tribunal's decision in the EnergyAustralia matter. The outcome of the Tribunal's decision was that, while the return on debt was estimated at a particular point in time (consistent with the on-the-day approach), it was not estimated at a point in time that was a close as practically possible to the commencement of the regulatory control period. We comment on the Tribunal's decision in the EnergyAustralia matter further in AER, *Access arrangement draft decision—APA GasNet (Operations) Pty Ltd—2013–17—Part 3 appendices*, September 2012, pp.17-23.

416 Ausgrid, *Regulatory revenue proposal*, May 2014, pp.72–73; Essential Energy, *Regulatory revenue proposal*, May 2014, pp.92–94; and Endeavour Energy, *Regulatory revenue proposal*, May 2014, pp.105–107.

417 CEG stated "Even if a business did try and issue all of their debt at the beginning of the regulatory period (a practice that is recognised as being inefficient and which no business actually [sic] undertook) it would still be impossible to issue 10 year debt at that time—unless all 10 year debt was repurchased at the end of each 5 year regulatory period and then reissued." CEG, *Debt transition consistent with the NER and NEL*, p.22.

combined this practice with interest rate swap contracts to match the risk free rate component of its return on debt to the on-the-day rate.[418] Specifically, we consider an efficient financing practice would have been:

- to borrow long term (10 year) debt and stagger the borrowing so that only a small proportion (around 10 per cent) of the debt matured each year
- to borrow using floating rate debt (or to borrow fixed rate debt and convert this to floating rate debt using fixed-to-floating interest rate swaps at the time of issuing the debt and which extended for the term of the debt, being 10 years), and
- to enter into floating-to-fixed interest rate swaps at, or around, the time of the service provider's averaging period and which extended for the term of the access arrangement period, being typically 5 years).

We consider this would have been an efficient financing practice of the benchmark efficient entity under the on-the-day because:

- Compared with the alternative possible debt financing strategies, this strategy would have more effectively managed refinancing risk and interest rate risk, and also resulted in a lower expected actual return on debt,[419] and
- It is the financing strategy that was generally adopted by most private service providers under the on-the-day approach.[420]

This financing strategy would have resulted in the risk free rate component of the benchmark efficient entity's actual return on debt matching the on-the-day rate, while the debt risk premium component each year would reflect the historical average of the debt risk premiums over the previous 10 years.

The staggering of debt under this strategy would have lowered refinancing risk, compared to if the benchmark efficient entity attempted to issue all its debt during the averaging period.

Adopting the strategy of a staggered debt portfolio with interest rate swaps, compared with a staggered debt portfolio without interest rate swaps, would have led to the same degree of refinancing risk. However, compared to the later strategy, adopting a staggered debt portfolio with interest rate swaps would have resulted in:

- lower interest rate risk—as interest rate risk would only have been borne on the debt risk premium component of the return on debt, rather than bearing interest rate risk on the total return on debt, and
- lower actual return on debt—as hedging using interest rate swaps has the impact of reducing the effective term of the debt. As longer term debt is typically more expensive than otherwise equivalent shorter term debt, due to the greater risks faced by the holders of long term debt,

---

418 Specifically, this would have been the swap rate for the contract (typically, a bank bill swap rate(BBSW)), rather than the risk free rate, that was matched to the allowed return on debt. However, the BBSW and the risk free rate are both low risk and so produce similar estimates. For simplicity, the analysis in this decision refers to the risk free rate.

419 Lally, M., *Transitional arrangement for the cost of debt*. November 2014, pp 25-30

420 Deloitte, *Refinancing, debt markets and liquidity*, 12 November 2008, p.13; Jemena, *Submission to the rate of return guideline consultation paper*, June 2013, p.19; Lally, M., *Transitional arrangement for the cost of debt*. November 2014, pp 25-30.

reducing the effective term would be expected to reduce the lower actual return on debt, on average.[421]

A staggered debt portfolio with interest rate swaps is also the financing strategy generally adopted by most private service providers under the on-the-day approach. This is reflected in the statements of corporate treasurers to the AER during the 2009 WACC review,[422] the data on debt financing strategies of the private service providers we collected during the 2009 WACC review,[423] and in submissions from private service providers to the 2012 AEMC during the network regulation rule change process,[424] and in submissions to us during the 2013 Rate of Return Guideline development process.[425] Where private service providers have explained the rationale for their debt financing strategy, this has been consistent with our explanation above of how this strategy lowers refinancing risk, lowers interest rate risk and lowers the actual return on debt. For example, during the 2009 WACC review, Envestra's corporate treasurer explained how its hedging strategy lowers interest rate risk. Envestra's corporate treasurer stated:[426]

> …the interest rate of the principal is usually floating rate consisting of a base rate, such as BBSW, plus a credit margin plus establishment fees… The Treasury Policy requires that we hedge between 80% and 100% of the interest rate risk on the floating rate debt.
>
> So to explain that in more detail, for each regulatory period we enter into hedges over the Regulators designated risk free rate averaging period, in order to match as closely as we can the base rate of our actual debt (i.e. BBSW) with the risk free rate used in the regulatory cost of debt and WACC. The hedges are for the term of the regulatory period.

This is also consistent with Lally's advice. Lally stated:

> Faced with the current regulatory regime, businesses have borrowed long term, with staggering, to deal with refinancing risk and used interest rate swap contracts to align the risk free rate component of their cost of debt with the regulatory cycle.[427]

Based on the above, we consider a staggered debt portfolio with interest rate swaps was an efficient financing practice of the benchmark efficient entity under the on-the-day approach. For the risk free rate component, we now consider what impact moving to the trailing average approach with or without transitional arrangements would have on the benchmark efficient entity. For the debt risk premium component we consider what the impact would be on the benchmark efficient entity in the next section.

Lally examined what the financing arrangements of the benchmark efficient entity would be at the end of the access arrangement period where the on-the-day approach was used. As Lally stated:[428]

> So, at the end of the most recent regulatory cycle, a swap of floating to five-year fixed for all of the firm's debt would just have matured (in line with the end of the regulatory cycle). If the previous regime had been maintained, the firm would then have entered a new swap of floating to five-year fixed for all of its debt. However, upon the introduction of a trailing average regulatory regime, the rationale for these swap

---

421 Lally, M., *Transitional arrangement for the cost of debt*. November 2014, pp 25-30

422 The Joint Industry Associations (JIA), *Submission on the explanatory statement: WACC review,* February 2009, Appendices, E, F, G, H and I; https://www.aer.gov.au/node/11822.

423 AER, *Final decision: review of electricity transmission and distribution WACC parameters*, May 2009, pp.150–154; AER, *Explanatory statement review of electricity transmission and distribution WACC parameters*, December 2008, pp.103–107.

424 ETSA Utilities, CitiPower and Powercor Australia, Submission attachments: Joint response to AER and URCC rules change proposals, December 2011, pp.138–143; ENA, *Response to AEMC Directions Paper – Economic Regulation of Network Service Providers (AEMC rules change),* 20 April 2012, Attachment E, pp.3–5.

425 Jemena, *Submission to the rate of return guideline consultation paper*, June 2013, p. 19.

426 JIA, Submission on the explanatory statement: WACC review, February 2009 – Appendix F: statement of Gregory Damian Meredith treasurer for Envestra, p.5.

427 Lally, *The trailing average cost of debt*, 19 March 2014, p.15

428 Lally, M., *Transitional arrangements for the cost of debt*, November 2014, pp.7-8.

> contracts would disappear and the firms could be expected to desist from them at that point. Nevertheless, in respect of the risk-free rate component of its debt, the existing debt has already been converted to floating rate debt and these swaps have residual lives of up to nine years (arising from ten-year debt that was issued one year ago).

Lally examined the actual and allowed risk free rate component of the return on debt for a benchmark efficient entity under various possible future interest rate outcomes. He demonstrated that applying transitional arrangements minimises the mismatch between the actual and allowed risk free rate component of the return on debt. Lally calculated that the mismatch between the risk free rate component of the costs actually incurred by a benchmark efficient entity and those allowed under our transitional regime would be between an over recovery averaging 0.6% of the debt portfolio per year and an under recovery averaging 0.4% per year over the transitional period.[429] Lally stated that this suggested that the actual outcome for the benchmark efficient entity will not differ much from zero.[430]

Lally also investigated the impact of an alternative strategy that would be open to the benchmark efficient entity. Lally described this strategy as:

> This analysis presumes (plausibly) that, upon the introduction of the trailing average regime with the proposed transitional regime, firms will desist from entering into the floating to five-year fixed rate swap contracts that they would have entered into under the previous regime. However, it is possible that firms might enter into alternative arrangements in an attempt to reduce or eliminate the exposure shown in equations (3). The best such option would involve the regulated businesses entering into a series of swap contracts upon the commencement of the new regime, to swap each of their prevailing floating-rate exposures into a fixed rate for the remainder of the borrowing. Thus, the debt with one year to maturity would be swapped into one-year fixed-rate debt, the debt with two years to maturity would be swapped into two-year fixed-rate debt, etc.

He estimated that the outcome from this strategy on the benchmark efficient entity would be an average over-recovery of 0.23 per cent of the debt portfolio each year. Accordingly, under either financing strategy Lally concluded that:[431]

> …if the proposed transitional arrangements are adopted, the actual outcome for firms will not differ much from zero.

Based on this analysis we are satisfied that applying transitional arrangements minimises the potential mismatch between the risk free rate component of the allowed return on debt and the actual return on debt of the benchmark efficient entity, as it transitions its financing practices. We are also satisfied that our transitional arrangements are likely to have a minimal impact (including in relation to the costs of servicing debt across the access arrangement periods) on a benchmark efficient entity as a result of changing the return on debt methodology from one access arrangement period to the next.

Avoids potential windfall gains or losses to service providers or consumers from changing the regulatory regime

In relation to the debt risk premium component of the allowed return on debt, we are satisfied that a transition reduces the potential windfall gains or losses to service providers or consumers from changing the regulatory regime.

As noted above, the rules require us, when estimating the return on debt, to have regard to any impacts on a benchmark efficient entity that could arise as a result of changing the methodology used

---

429 These calculations are based on an assumption that the averaging period for the existing debt is June 2014. The averaging period differs for different service providers, and this would impact the exact calculations for each service provider, but not the overall conclusions drawn from these calculations.

430 Lally, M., *Transitional arrangements for the cost of debt*, November 2014, p.10

431 Lally, M., *Transitional arrangements for the cost of debt*, November 2014, p.11

to estimate the return on debt from one access arrangement period to the next. In this decision we are changing the methodology for estimating the return on debt. Specifically, we are moving from the previous on-the-day approach to a trailing average portfolio approach. As a result, this requirement is relevant. In Guideline, we considered this requirement and proposed a debt transition based on QTC's approach as a way of dealing with this issue.

Our consideration must be based on principle, specifically the allowed rate of return objective. Such a consideration is consistent with the need to have regard to potential impacts on a benchmark efficient entity. In turn, it will also provide greater certainty which all stakeholders, especially investors, value. We consider the following framework is a useful approach.

If applied consistently over the life of a regulated asset, both the on-the-day and trailing average methodologies provide a return on debt, on average, commensurate with the efficient financing costs of benchmark efficient entity. Changes in interest rates may create differences between the allowed return on debt and the actual return on debt of a benchmark efficient entity during any particular access arrangement period. However, over the life of the regulated assets, consistently applying either methodology promotes a benchmark efficient entity receiving revenues with an expected present value equal to the present value of its efficient costs. In other words, consistent application of either methodology accounts for these differences.

The above outcome is consistent with the NPV principle. Under the NPV principle, a benchmark efficient entity should receive revenues with a present value equal to the present value of its efficient costs. A benchmark efficient entity can earn higher or lower returns than the NPV principle implies. However, this should be the result of improvements or deteriorations in efficiency, rather than the result of windfall gains or losses. The NPV principle sits at the core of the building block framework in the rules, which includes the allowed rate of return objective.

As discussed in the previous section, with respect to the risk free rate component, we consider the allowed return on debt and the actual return on debt of a benchmark efficient entity would have broadly matched each access arrangement period. This is because of the hedging arrangements we consider a benchmark efficient entity would have undertaken under the on-the-day approach. However, with respect to the debt risk premium component, the debt risk premium component could not have been hedged. This means that in some access arrangement periods, the allowed debt risk premium would have exceeded the actual debt risk premium of the benchmark efficient entity. In other access arrangement periods, the allowed debt risk premium would have been less than the actual debt risk premium of the benchmark efficient entity. However, over a number of periods, these differences might be expected to broadly cancel each other out.

When the methodology for estimating the return on debt changes during the life of a regulated asset, the NPV principle is unlikely to be met automatically. Any pre-existing differences between the allowed return on debt and the actual return on debt of a benchmark efficient entity remain. The service provider will receive a return on debt that is different from the benchmark efficient entity and consumers will pay prices that reflect this difference.

In these circumstances, departures from the NPV principle are not the result of changes in efficiency. Rather, they are a consequence of changing the estimation methodology. Therefore, in our opinion, the resulting benefits or detriments are windfall gains or losses that the regulatory regime should avoid. In other words, regardless of who obtains the benefit or detriment, an immediate change from one methodology to another has the potential undesirable consequences. Also, this should be a concern for both the benchmark efficient entity and for consumers as, ex ante, they could not know for certain whether they would obtain a benefit or detriment.

It is possible to avoid the undesirable outcomes described above by applying a transition. The regime can then account for differences between the return on debt estimate and the actual return on debt of a benchmark efficient entity, despite any change in methodology. Transitioning the return on debt estimation from one approach to another over time, rather than changing immediately, assists to achieve this. In turn, by using a debt transition, a benchmark efficient entity will receive a return on debt commensurate with its efficient financing costs over the life of its assets (rather than commensurate with windfall gains or losses). Therefore, we are satisfied that including a debt transition in the return on debt estimation will result in a return on debt that contributes to the achievement of the allowed rate of return objective.

The present circumstances are ones in which the prevailing return on debt is lower than the 10 year historical average. This is because the return on debt significantly increased during the global financial crisis, but has subsequently decreased. In these circumstances, Lally estimated the impact on a benchmark efficient entity with different access arrangement cycles on continuing with the on-the-day approach, or switching to the new approach with or without transitional arrangements.

Lally found that either continuing with the on-the-day approach or switching to the new approach with a transition results in a similar outcome. And results in approximately a 1.3 per cent average over recovery of the debt portfolio across all service providers, in present value terms. In contrast, switching to the new approach without a transition results in approximately a 3.4 per cent average over recovery of the debt portfolio across all service providers. Lally's analysis is summarised in table 3-26. Accordingly, transitional arrangements reduce the potential for windfall gains or losses to service providers or consumers.

Table 3-26 Impact of transitional arrangements—Cash flow effects in present value terms

Service provider's access arrangement period cycle includes:	Continuation of on-the-day approach	Switching to trailing average portfolio approach: - without transitional arrangements	Switching to the trailing average portfolio approach: - with transitional arrangements
2007–2012	-0.5%	1.3%	-0.5%
2008–2013	4.5%	5.8%	4.5%
2009–2014	4.2%	6.6%	4.3%
2010–2015	-0.1%	2.3%	-0.1%
2011–2016	-1.5%	0.9%	-1.5%
Average	1.3%	3.4%	1.3%

Source: Lally[432]

Overall, Lally advised:[433]

432 Lally, *Transitional arrangement for the cost of debt*, November 2014, p.24.
433 Lally, *Transitional arrangement for the cost of debt*, November 2014, p.24.

In summary, there are now three arguments supporting the AER's proposed transitional regime for the DRP. Firstly, it avoids problems with the availability of historical DRP data. Secondly, it mitigates the windfall gain that businesses on average experience at the expense of their consumers, arising from the GFC-induced DRP shock coupled with the switch to a trailing average regime from mid 2014, and this can be equivalently expressed as producing results that better conform to the NPV = 0 principle. Thirdly, it produces results for individual businesses that are almost identical to those that would have prevailed had there been no regime change. However, in respect of the DRP and as noted in section 2.1, desisting from a transitional process has the apparent advantage of eliminating any mis-match between the allowed and incurred costs after the regime change. Thus, it is important to assess the relative merits of these competing arguments. The windfall gain and mis-match issues here are closely related. Without a transitional regime, there would be no mis-match after the regime change but there would be a windfall gain to businesses up to the time of the regime change. By contrast, the proposed transitional process mitigates the windfall gains but necessarily leads to a mis-match between the allowed and incurred costs after the regime change. The windfall gain issue is the more important one because it takes account of the entire consequences of the regime change and the GFC-induced shock to the DRP rather than only the consequences after the regime change. So, in respect of the DRP, there are now three supporting arguments for the proposed transitional regime and no contrary ones. Furthermore, adoption of this transitional regime is consistent with the requirement under clause 6.5.2 of the NER to have regard to the impact on a benchmark efficient entity of a change in methodology. In addition, it should be emphasized that this mitigation of the windfall gains that businesses would otherwise have received at the expense of their customers does not constitute a claw-back and it would not undercut the existing incentives for businesses to reduce their costs

In revenue terms, this is one of the most material issues in this decision. The materiality of this issue has drawn comment about who should obtain any benefit or detriment resulting from a change in methodology. Service providers who proposed no transition have characterised the debt transition as creating a windfall loss. Consumers have characterised such proposals as seeking to secure a windfall gain.[434] While we acknowledge this discussion, our task has a different focus. Our task is to consider the impact on the benchmark efficient entity and to determine a return on debt that will contribute to the achievement of the rate of return objective. Therefore, we are satisfied that a transition, based on QTC's proposed approach to debt transition contributes to the achievement of the rate of return objective.

We note Lally's advice that:[435]

Finally, if the combined effect of the GFC-induced shock to the DRP and the regime change had been to inflict losses rather than gains on to the businesses and if transitional arrangements relating to the DRP had been able to significantly mitigate these losses, I would have also favoured such transitional arrangements.

Consistent with Lally's advice, we consider where the prevailing return on debt is either above or below the 10 year trailing average, adopting transitional arrangements can reduce the potential windfall gains or losses to service providers or consumers, with respect to the debt risk premium, from changing the regulatory regime from the on-the-day approach to the trailing average portfolio approach.

Avoids practical problems with the use of historical data

Transitional arrangements avoid practical problems associated with the use of historical data. These practical problems relate to the debt risk premium component, rather than the risk free rate component.

434 CCP, *Network NSW distributors cost of debt proposals—Consumer Challenge Panel advice to the AER*, October 2014, pp.10-15.

435 Lally, *Transitional arrangement for the cost of debt*, November 2014, p.24.

In the absence of transitional arrangements, historical data on the return on debt would be required—for the period 2005–06 to 2014–15 or 2006–07 to 2015–16 depending on the service provider.[436]

For the risk free rate component, high quality data on the historical yield of long term commonwealth government securities (CGS) are readily available from the RBA.

However, for the debt risk premium component, similarly high quality and readily available data is not available. This is because:

- There is no third party data series that is available for the full 10 year historical period, meaning a mixture of data series for different time periods would be required. The RBA and Bloomberg (BVAL) data series commenced in January 2005 and April 2010, respectively.[437] Whereas, the CBA Spectrum and Bloomberg fair value curve data series ceased publication in August 2010 and May 2014, respectively. Service providers with current regulatory proposals and their consultants (CEG, NERA) have acknowledged this issued and proposed a combination of data series in order to immediately implement the trailing average approach. Specifically, they proposed to use nine years of the RBA data series and combine this with one year of the Bloomberg fair value curve series for the earliest year.
- There has been considerable variation in the results of the different data series, which complicates the choice and materiality of choosing between or combining different data series for different time periods. For example, Lally stated:[438]

  > Furthermore, there has been considerable variation in the results from four such indexes since early 2007, most particularly in early 2009 when the estimates of the RBA, CBA Spectrum, and BFV indexes were 9.5%, 5.0% and 3.5% respectively (CEG, 2014, Figure 1); this variation complicates the process of choosing estimates for that historical period.

- It is not clear to us if each data series is of comparable or varied quality, and whether this changed over time. For example, during the first several years of the RBA data series the sample size was small, whereas it has increased in more recent years.[439]

The available data from the RBA, Bloomberg (BVAL), Bloomberg fair value curve, and CBA Spectrum data series for the last ten years is shown in Figure 3-10.

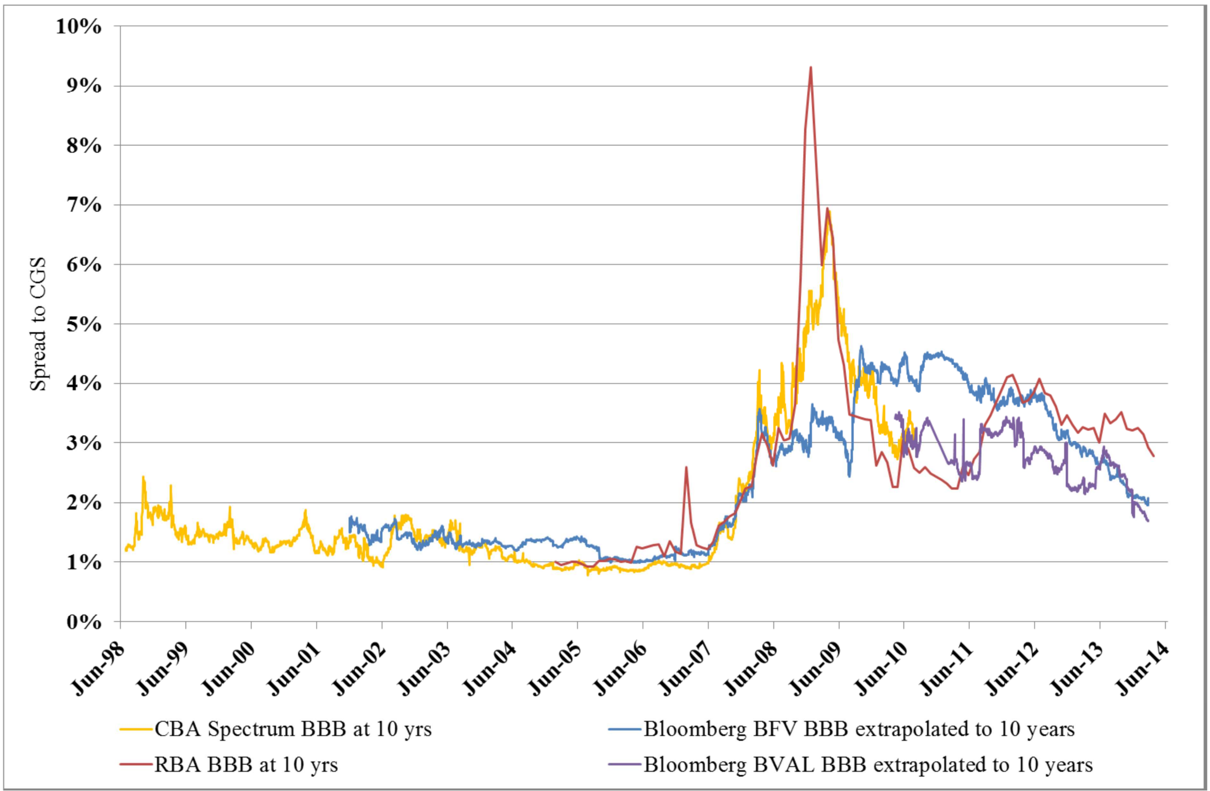
[436] For the NSW distribution network service providers, TransGrid, TasNetworks (Transend) and ActewAGL data series will be needed for 2005–06 to 2014–15; and for JGN and Directlink, 2006–07 to 2015–16.

[437] We note the BVAL series has missing data, particularly from late October 2010 to late January 2011.

[438] Lally, M., *Transitional arrangements for the cost of debt*, November 2014, p.15.

[439] The number of bonds in the sample for any particular monthly estimate is published on the RBA's website.

Figure 3-10 Comparison of alternative historical debt data series



Source: CEG

In contrast, adopting transitional arrangements avoids these practical problems with the use of historical data. This is because our transitional arrangements do not use any data from before 2014. We have been able to conduct a detailed assessment of the data series which are currently available, and also considered carefully how those data series should be combined. Accordingly, we have a degree of confidence in the reliability of the return on debt resulting in our combination of those data series. We would not have the same degree of confidence in the reliability of a historical return on debt, for the reasons outlined above.

Maintains average price level while decreasing price volatility over time

Transitional arrangements maintain the same average price level while decreasing price volatility over time.

The on-the-day approach or the trailing average portfolio approach can be expected to result in a different allowed return on debt for any particular access arrangement period. This is because the former is based on the prevailing return on debt shortly before the start of the access arrangement period, whereas the latter is based on a historical average. However, as discussed above, applied consistently over many access arrangement periods, each could be expected to result in a similar average return on debt, and therefore led to a similar average level of prices. The difference is that the on-the-day approach would lead to relatively higher price volatility for a given average price level, whereas the trailing average portfolio approach would lead to relatively lower price volatility, for the same average price level.

However, changing between regulatory approaches without transitional arrangements may lead to a different average return on debt, and therefore a different average price level, than would result from either approach being applied consistently over time. Specifically, moving from the on-the-day approach to the trailing average portfolio approach when:

- prevailing interest rates are below the historical average—would result in a higher average return on debt, and therefore higher average price level, than if either approach was applied consistently over time, and
- prevailing interests are above the historical average—would result in a lower average return on debt, and therefore a lower average price level, than if either approach was applied consistently over time.

We would be concerned about either outcome occurring.

During the guideline process, consumers told us that price stability is in their interests, but not price stability at any cost.[440] Similarly, during the current determination process, the consumer challenge panel was clear that efficient price levels were more important than reducing volatility.[441]

Our transitional arrangements result in consumers facing a similar average level of prices over time (as what would resulted from continuing the on-the-day approach) and provides price stability over the medium to long term, in line with the progressive introduction of the trailing average.

Reduces the potential for opportunistic behaviour from stakeholders

We consider that the application of transitional arrangements is likely to minimise the potential for opportunistic behaviour.

Service providers have an incentive to propose the return on debt approach that maximises revenue.[442] In particular, we sought to discourage situations where, for example, service providers could seek to adopt the on-the-day regulatory approach when the prevailing return on debt is high; and the trailing average approach (with no transition) when the prevailing return on debt is low. We explained that the adoption of a single benchmark approach to the return on debt estimation coupled with transitional arrangements between approaches is likely to reduce incentives for service providers to behave strategically in a manner that maximises their revenue.[443] Strategic behaviour is a particular concern where the choice between two approaches can be informed with the benefit of hindsight. This situation potentially arises if there is no transition to the trailing average. We maintain view that in this draft decision.

Consistent with single benchmark efficient entity definition

---

440 EUAA, *Submission to the Australian Energy Regulator on its Rate of Return Issues Paper*, February 2013, p.1.

441 Consumer challenge panel (CCP), *Jam tomorrow: Submission on NSW DNSPs proposals*, August 2014, pp.11–12.

442 For example, there is a history of service providers switching their preferred method to estimate the market risk premium (MRP). This behaviour is consistent with service providers seeking to maximise their regulated revenues, rather than following a consistent position over time. In relation to the MRP, this trend has been from preferring: (1) historical excess returns; to (2) implied volatility; to (3) conditioning variables that included implied volatility and debt risk premiums; to (4) dividend growth model (DGM) estimates. In particular, for several years following the global financial crisis implied volatility estimates resulted in high estimates of the MRP. During this period, a number of service providers proposed MRP estimates that were based in full, or in part, on implied volatility estimates. However, in recent years the trend of these estimates has changed and they now largely produce results which are less than their historical average. Since this decrease in implied volatility estimates, service providers no longer propose these estimates be given significant weight in estimating the MRP.

443 AER*, Explanatory statement—Rate of return guideline*, December 2013, p.100.

We are satisfied that applying a single benchmark for the purpose of estimating the return on debt is consistent with our approach to the overall rate of return. This is likely to contribute to achieving the allowed rate of return objective.

We adopt a benchmark approach to transitional arrangements; that is, to apply the transition uniformly. In making this decision we have considered the requirements of the rules and our analysis on the benchmark definition in the Guideline.

Under the rules we are required to set a rate of return which reflects the efficient financing costs of a benchmark efficient entity which is subject to a similar degree of risk in providing regulated service as the service provider.[444] For the reasons set out in the Guideline, we proposed to apply a single benchmark definition for the purpose of determining the overall rate of return. This approach means a single benchmark should apply for the purpose of estimating the return on debt and return on equity. For the return on debt estimation, it also means applying a single benchmark definition for the purpose of implementing transitional arrangements.

For the reasons set out in the Guideline, we considered that regulated service providers operating in electricity and gas industries are likely to face similar risks whether they operate in transmission or distribution segment.[445] After analysing different risks faced by the service providers we regulate, we are satisfied that that their net risk exposure, taking into account the risk and the mitigating impact of the regulatory regime, is sufficiently similar to warrant the use of only one benchmark.[446]

We also considered whether to include factors such as ownership and size in the definition of the benchmark efficient entity. In respect of ownership, we were not satisfied that it is possible to specify a single ownership structure which is efficient.[447] In regard to size, we considered it is a fluid concept. We regulate a number of service providers, each with a different asset base size. We were not persuaded the difference in size would impact the risks faced by the benchmark efficient entity. However, if we were to differentiate the rate of return on size, it is not clear how many benchmarks should be specified (for example: two benchmarks – big and small; three benchmarks – small, medium and big; etc.). It would also be difficult to establish an objective criterion to establish the 'border' between each benchmark, and that benchmark may also change over time. Further, we were satisfied that the overall risk level of the service providers we regulate was sufficient similarly not to warrant stratification based on size.

Lally supported a uniform adoption of transition. He observed that the sector of operation had no relevance with his analysis of the potential for windfall gains and losses resulting from the adoption of the trailing average approach with no transition.[448] He also observed that service providers' arguments for differential transition relate to debt management practices (hedging or no hedging).[449] He then concluded that the debt management practice on which our transition is premised is reasonable because:

> …even for the largest regulated businesses and under the previous on-the-day regulatory regime, these hedging arrangements were highly efficient.[450]

Response to key issues raised by stakeholders

---

444 NER, r.6A.6.2(c) and r.6.5.2(c); NGR, r.87(3).
445 AER, *Draft Explanatory statement—Rate of return guideline*, December 2013, pp.34–51.
446 AER, *Draft Explanatory statement—Rate of return guideline*, December 2013, pp.34–46.
447 AER, *Draft Explanatory statement—Rate of return guideline*, December 2013, pp.50–51.
448 Lally, M., *Transitional arrangement for the cost of debt*. November 2014, p.25.
449 Lally, M., *Transitional arrangement for the cost of debt*. November 2014, pp.25–26.
450 Lally, M., *Transitional arrangement for the cost of debt*. November 2014, p.28.

In each of the regulatory proposals current before us, all service providers have proposed a trailing average portfolio approach with annual updates to calculate the return on debt going forward, consistent with the Guideline. However, in these proposals:

- some service providers have adopted our transitional arrangements (JGN, TasNetworks)—we accept their proposal
- other service providers proposed no transition to the trailing average portfolio approach (AusGrid, Endeavour, Essential, TransGrid (NSW service providers), ActewAGL, Directlink)—we do not accept their proposals for the reasons set out in this attachment and appendix G.

Submissions we received from consumer stakeholders in this draft decision process supported our approach to the return on debt, including the transitional arrangements.[451] Further, we have recently received regulatory proposals from Energex, Ergon and SA Power Networks. Each of these service providers propose transitional arrangements in moving to the trailing average portfolio approach.

Table 3-27 summarises service providers' key reasons for proposing the trailing average approach without a transition to calculate the return on debt. The table also sets out a summary of our response. We respond to these issues further in appendix G.

[451] PIAC, *submission on DNSPs regulatory proposal*, August 2014, pp.82–90; AGL, *submission on DNSPs regulatory proposal*, August 2014, p.20; Energy Markets Reform Forum, *NSW Electricity Transmission Revenue Reset: A response*, July 2014, pp.29 and 32; Norske Skog, *NSW electricity transmission revenue reset: Norske Skog Albury Mill's response to TransGrid's Application*, p.8.

Table 3-27 Key issues raised by service providers in support of no debt transition

Issue	Stakeholder	Our response
A preferable approach would be to adopt different benchmark efficient entities for large service providers and small service providers.[452]	Ausgrid, Essential, Endeavour, TransGrid, CEG and NERA	We adopt a single benchmark definition for the purpose of determining the rate of return. This is consistent with the allowed rate of return objective and with incentive regulation. We are satisfied that service providers across different energy sectors and different sizes face sufficiently similar risk to warrant the adoption of a single benchmark efficient entity definition. Accordingly, we adopt a single benchmark for the purpose of determining the allowed return on debt.
NSW service providers are too big and could not hedge in the manner assumed by the AER	Ausgrid, Essential, Endeavour, TransGrid and NERA	We are not satisfied that a (private) benchmark efficient entity with risks similar to that faced by the NSW service providers would not have hedged. Our task is to determine a return on debt commensurate with the efficient debt financing costs of the benchmark efficient entity. In this respect, the actual debt financing practices of the NSW service providers would be useful only to the extent they reflect the efficient financing practices of the benchmark efficient entity. The intent of the regulatory framework is that the efficient private service provider informs the definition of the benchmark efficient entity. We are satisfied that for a private benchmark efficient entity, an efficient financing practice under the on-the-day approach would have been to borrow long term and stagger the borrowing so that only a small proportion of the debt matured each year. In addition, this entity would have entered into interest rate swap contracts to match the risk free rate component of its return on debt to the on-the-day rate. We consider that some degree of hedging (even if imperfect) would have been prudent and efficient for the benchmark efficient entity. The information before us indicates that hedging

452 CEG phrased this argument in terms of service providers who have already structured their debt consistent with the trailing average approach versus service providers who have not (p.16).

		was more feasible than submitted by the NSW businesses.
Transition delays the implementation of a benchmark efficient cost of debt allowance.	Ausgrid, Essential, Endeavour, TransGrid, CEG and NERA	We do not agree with the proposition that a transition delays the benefits of the trailing average portfolio approach. Transitional arrangements maintain the same average price level while decreasing price volatility over time.
NSW service providers already adopt a staggered debt portfolio, and therefore a transition is not necessary.	Ausgrid, Essential, Endeavour, TransGrid, CEG and NERA	In our review of the NSW service providers' proposals, we assessed whether, the actual financing practices of government-owned network service providers would be useful to inform the efficient financing practices of the benchmark efficient entity. It is not clear to us that the actual debt financing practices of the NSW service providers, or government owned service providers more generally, are useful in informing the efficient debt financing practices of the benchmark efficient entity.
Transition encourages inefficient debt financing strategies — imposing a transition would move a benchmark efficient entity away from the trailing average approach to the on-the-day approach; and transition it back to the trailing average approach over 10 years.	Ausgrid, Essential, Endeavour, TransGrid, CEG and NERA	We disagree with the NSW service providers that transition would encourage inefficient behaviour First, we are not satisfied that the NSW service providers' financing practices reflect those of the benchmark efficient entity under the on-the-day approach. It is the benchmark efficient entity's transition (not that of the NSW service providers) that we evaluate. Second, in the first regulatory year, our transition on the risk free rate places the benchmark efficient entity in a similar interest rate risk situation it would have been in had the on-the-day approach continued. If the benchmark efficient entity did not consider it was efficient to hedge this exposure under the on-the-day regime, then it would have no reason to change its financing strategy now. If the benchmark efficient entity considers that a transition encourages hedging the interest rate risk, then this indicates it should have also hedged that exposure in the past.
The imposition of a transition will not provide the NSW service providers with a reasonable opportunity to recover at least their efficient financing costs.	Ausgrid, Essential, Endeavour, TransGrid, CEG and NERA	Our transition is designed to meet the efficient financing costs of a benchmark efficient entity, not the costs of the NSW service providers.

ActewAGL is 100 per cent financed by equity and has no debt financing. It should be deemed to already have adopted the benchmark efficient debt management strategy. Therefore, transition is not necessary.	ActewAGL, CEG	The benchmark efficient entity was not financed by 100 per cent equity, but by a mixture of 60 per cent debt and 40 per cent equity. The rules are concerned with the benchmark efficient entity's transition from the on-the-day to trailing average approach, not the transition of ActewAGL's actual financing arrangements.
High quality data is available to implement an immediate adoption of the trailing average approach.	Directlink	There are both practical and strategic behaviour difficulties with the use of historical data. Further, Directlink has not attempted to engage with our other reasons for adopting transition. We largely maintain those reasons in this decision.

Source: Regulatory proposals, AER analysis.

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

Term

Our draft 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, all service providers proposed a 10 year term for the return on debt.[453] We agree with that component of those proposals. A 10 year term is also consistent with the advice from NERA and CEG.[454]

We are satisfied that a 10 year term is commensurate with the efficient financing costs of a 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.
- 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 the benchmark efficient entity will not be able to refinance 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

---

453 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; Essential Energy, *Revenue proposal*, June 2014, pp. 90–91; JGN, *Access arrangement information*, June 2014, p. 96; TasNetworks, *Revenue proposal*, June 2014, p. 108; Transgrid, *Revenue proposal*, June 2014, p. 178.

454 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.

with holding debt over a longer time period. Accordingly, the benchmark efficient 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, but they do not provide clear guidance on what exactly that term should be.

During the development of the rate of return guideline, we requested information from a range of privately owned service providers on the amount, type, term and credit rating of their debt issuances.[455] 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). 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 assumption for the benchmark debt term. Though we also consider that, if anything, this assumption is more likely to overstate than understate the debt term of a 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. 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 draft decision, we consider this information in relation to whether it is necessary to extrapolate the third party data series we have adopted out to the 10 year benchmark debt term. Our consideration of this issue is set out in the extrapolation and interpolation issues section below.

Credit rating

Our draft 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.

In the regulatory proposals currently before us, service providers proposed different credit ratings for the benchmark efficient entity. TransGrid, Directlink and TasNetworks each proposed a BBB+ credit

---

[455] 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.

rating.[456] We agree with this component of those proposals. Ausgrid, Endeavour Energy, Essential Energy, ActewAGL and JGN proposed a BBB credit rating.[457] We do not agree with this component of their proposals.

NERA (commissioned by TransGrid) recommended a BBB+ credit rating, stating, 'in our opinion a BBB+ credit rating is the best estimate of the benchmark credit rating'.[458] CEG (commissioned by Ausgrid, Endeavour Energy, Essential Energy and ActewAGL) recommended a BBB credit rating.[459] And Lally (commissioned by us) 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.[460] The CCP submitted we do not need to base the allowed return on debt on the universe of bonds with a specified credit rating.[461] While we see merit in the CCP's submission, at this stage, we consider it is a practical necessity to predominately estimate the allowed return on debt on a benchmark credit rating and term.[462]

We adopt BBB+ as the benchmark credit rating because:

- 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.[463] The ratings agency, Moody's, appears to concur 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.[464] We note that Standard and Poor's consider the regulatory framework a critical aspect underlying regulated utilities' creditworthiness.[465]

- 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.[466] The median credit rating across our comparator set is BBB+ for the current year. But 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.[467] For historical periods of progressively longer length (starting with the current year, then the last two years, then the last three years, etc, up to the last 10 years), the median credit rating has been BBB+ in six out of ten cases, BBB+/BBB in two cases, and BBB in two cases. While some

---

456 TransGrid, *Revenue proposal*, May 2014, p. 178; Directlink, *Revenue proposal*, May 2014, p. 36; TasNetworks, *Tasmanian transmission revenue proposal*, May 2014, p. 108.

457 Ausgrid, *Regulatory proposal*, May 2014, pp. 70–71; Endeavour Energy, *Regulatory proposal*, May 2014, pp. 104–105, 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.

458 NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014, pp. ii, 10.

459 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.

460 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 28–31.

461 CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2014, p. 6.

462 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 section G.2.3 of appendix G on the return on debt, for an explanation on why we use credit ratings as an indicator of the return on debt.

463 McKenzie, Partington, *Risk, asset pricing models and WACC*, June 2013, p. 15.

464 Moody's, *Industry outlook: Australian Regulated Utility Networks*, 21 February 2013, p. 8.

465 Standard and Poor's, Key *credit factors: Business and financial risks in the investor–owned utilities industry*, November 2008, p. 8.

466 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 section 2.2 of the return on debt appendix. These credit ratings were updated in August 2014.

467 Lally, *Implementation issues for the cost of debt*, November 2014, p.29.

evidence supports a BBB credit rating (e.g. the median over the last five years), we are satisfied that, on balance, the evidence supports a BBB+ credit rating (e.g. the current year median and median over the last 10 years).

Table 3-28 sets out the median credit rating over progressively longer averaging periods.

Table 3-28 Median credit rating—Comparator set of firms

Time period	Median credit rating	Time period	Median credit rating
Current year (2014)	BBB+	2009–2014	BBB
2013–2014	BBB+	2008–2014	BBB/BBB+
2012–2014	BBB+	2007–2014	BBB+
2011–2014	BBB/BBB+	2006–2014	BBB+
2010–2014	BBB	2005–2014	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 advises that he does not consider one can differentiate between the benchmark credit rating of electricity and gas service providers at the present time.[468] 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 definition of the benchmark efficient entity. Our reasons for this position are set out in the explanatory statement to the Guideline.[469] No new information has arisen since the publication of the Guideline that causes us to depart from this position of a single definition of the benchmark efficient entity.

Stakeholders submitted differing positions on the benchmark credit rating. We are not satisfied these submissions provide reason to depart from our BBB+ benchmark credit rating. In appendix D 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 note 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 data series

Our draft decision is to adopt an independent third party data series to estimate the return on debt. Using of a third party data series is the same approach we proposed in the Guideline.

All service providers with current regulatory proposals proposed to use a third party data series to estimate the return on debt. We agree with this component of those proposals. On the other hand, the CCP recommended using service providers' actual borrowing costs as a reasonableness check

468 Lally, *Implementation issues of the cost of debt*, November 2014, p.31.
469 AER, *Explanatory statement to the rate of return guideline*, 17 December 2013, pp. 32–45.

and/or using an industry index based on actual borrowing costs.[470] Regarding the latter option, the CCP advised:[471]

> As an example, we could establish a benchmark for setting debt risk premia on the actual borrowing costs of the group of regulated firms for a particular specification – say electricity network service providers.

We are satisfied that using a third party data series (or multiple series), appropriately chosen, is commensurate with the efficient debt financing costs of a benchmark efficient entity. It is also consistent with the rule requirement that the change in revenue (resulting from the annual debt update) is effected through the automatic application of a formula that is specified in the decision. This is because:

- A third party data series can be practically applied in the annual debt update process—As noted above, the rules require that if we apply annual updating (or any other approach that could result in a different return on debt each year), then the change in revenue must be effected through the automatic application of a formula that is specified in the decision.[472] 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'.[473] 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 (e.g. weighting of data series, extrapolation, or interpolation issues) during the decision process. We can then add a formula to the decision and apply it mechanistically during the annual debt update process.

- 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).[474] The Australian Competition Tribunal has found both approaches reasonable.[475]

---

470 CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2014, pp. 4, 12.

471 CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2014, p. 6.

472 NER, cl.6A.6.3(l), NER, cl. 6.5.2(l) and NGR, r. 87(12).

473 NERA, *Return on capital of a regulated electricity network: A report for Ashurst*, May 2014, p. 10.

474 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

During the Guideline development process, we considered this issue, in consultation with stakeholders.[476] Service providers tended to support using a third party data series.[477] While consumer representatives tended to consider we should develop our own data series.[478] We acknowledge these views. However, our draft decision is to use a third party data series, in the context of annual updating, for the reasons set out above.

Response to key issues raised by stakeholders

In submissions on the current 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.[479]
- Service providers' actual borrowing costs.[480]

We acknowledge the views of consumer representatives on this issue. And we share some of the concern expressed at relying heavily on credit ratings, and not industry, as the measure of risk for estimating the return on debt of the benchmark efficient entity.[481]

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 because this reduces the volatility of prices between regulatory periods (by introducing a small degree of price volatility within the regulatory period). And it also reduces the potential mismatch between the actual and allowed return on debt of the benchmark efficient entity. We note that 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.[482]

(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.

475 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.

476 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.

477 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.

478 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.

479 MEU, *Tasmanian Electricity Transmission Revenue Reset, TasNetworks Application: A response*, August 2014, pp. 34–35; EMRF, *AER review of NSW electricity transmission*, July 2014, pp. 32–34; Tasmanian Small Business Council, *Submission on TasNetworks revenue proposal*, 8 August 2014, p. 42.

480 CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2014, p. 6.

481 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.

482 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.

Further, we do not apply a benchmark or data series based on service providers' actual borrowing costs. We note that in its submission, the CCP did not suggest precisely how we should use this data.[483] We would not apply this approach unless we had a sound idea of how to implement it well. Currently, we consider there would be several important challenges in implementing this approach:

- 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.

- 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.

- 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 requires benchmark regulation.[484]

- 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.[485] The AEMC has concluded an efficient private sector service provider is the most appropriate benchmark. In particular:[486]

  > If state-owned businesses issued their own bonds, without a government guarantee, they would face materially similar borrowing costs to privately-owned service providers. In the absence of competitive neutrality provisions, electricity consumers are unlikely to be better off from defining a separate benchmark for state-owned service. 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.

- If we were to include the actual debt costs of public sector service providers in our benchmark, we would need to include debt guarantee fees, which are a genuine cost to the service provider. Debt guarantee fees reflect a business’s indicative, stand-alone credit rating or commercial status.[487]

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.

Choice of data series

Our draft 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),[488] and

---

483 CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2013, p. 3.

484 NER, cl. 6A.6.2(c), NER, cl. 6.5.2(c), and NGR, r. 87(3).

485 CCP, *Smelling the roses and escaping the rabbit holes: the value of looking at actual outcomes in deciding WACC*, July 2013, p. 12.

486 AEMC, *Final rule change determination*, November 2012, p. 72.

487 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.

- where available, the Bloomberg broad-BBB rated 7 year BVAL curve (the BVAL curve), otherwise the Bloomberg broad-BBB rated 5 year BVAL curve[489]

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
- Both curves require adjustments from their published form to make them suitable, and 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 that we adopt a simple average of the BVAL curve and the RBA curve,[490] subject to the necessary adjustments to each curve. In particular, Lally concluded that based on analysis of the curves, it was reasonably likely that a simple average of the two curves would produce an estimator with a lower mean squared error (MSE), than using either curve in isolation. Lally also noted 'on the question of which index better reflects the cost of debt for the efficient benchmark entity, there is no clear winner'.[491]
- 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 Tribunal's decision in the ActewAGL matter where the Tribunal concluded that:

  > if the AER cannot find a basis upon which to distinguish between the published curves, it is appropriate to average the yields provided by each curve, so long as the published curves are widely used and market respected.[492]

- 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 draft decision is also to make certain adjustments to the RBA and BVAL curves. 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. 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

488 The RBA refers to this curve as 'Non-financial corporate BBB-rated bonds'.
489 The Bloomberg ticker for this curve is: BVCSAB07.
490 Lally, *Implementation issues for the cost of debt*, November 2014, p.3.
491 Lally, *Implementation issues for the cost of debt*, November 2014, p. 5.
492 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.

estimation approach is set out in Appendix G. This is the formula that will be automatically applied to give effect to the requirements of the rules.[493]

There is a range of views from service providers on the choice of data series. In the regulatory proposals currently before us (and subject to our November 2014 draft decisions):

- ActewAGL, Ausgrid, Directlink, Endeavour Energy, Essential Energy, TasNetworks and TransGrid proposed to place 100 per cent weight on the RBA curve.[494]
- 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.

We do not agree with this component of those proposals. We have also received views from other service providers. These views are:

- in responding to our May 2014 issues paper:[495]
  - Citipower, Powercor and South Australia Power Networks (SAPN) submitted they were not yet in a position to present a proposed position on the assessment of third party service providers.[496]
  - United Energy and Multinet Gas submitted that "[t]he Bloomberg BVAL curve and the RBA corporate bond index are both performing well but UE and MG would like to see incremental improvements to the way in which the RBA estimates are derived."[497]
- in their October 2014 regulatory proposals:
  - Energex[498] and Ergon[499] proposed to place 100 per cent weight on the RBA curve
  - SAPN proposed a simple average of the RBA curve and the BVAL curve.[500]

As noted above, our draft 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 G.

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.[501] 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.

---

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

494 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.

495 AER, *Return on debt—Choice of third party data service provider: Issues paper*, April 2014, p. 11.

496 Citipower, Powercor and SA Power Networks, *Submission to the return on debt issues paper—Choice of third party data provider*, May 2014, p. 3.

497 United Energy and Multinet Gas Network, *Submission to the return on debt issues paper—Choice of third party data provider*, May 2014, p. 8.

498 Energex, *2015–20 Regulatory proposal—June 2015 to June 2020*, October 2014, p. 173.

499 Ergon, *Regulatory proposal—2015 to 2020*, October 2014, p. 124.

500 SA Power Networks, *Regulatory proposal—2015 to 2020*, October 2014, p. 339.

501 AER, *Explanatory statement—Rate of return guideline*, December 2013, pp. 23–24.

For this draft decision, we have considered which curve or combination of curves will better reflect the efficient financing costs of a 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 access arrangement 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.[502] 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.[503] 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 , and
- curve fitting (or averaging) methodology—this describes how that data is used to produce a return on debt estimate for a particular term (e.g. 10 years).

Our analysis has been informed by information from the RBA,[504] and expert reports by REU[505] and Lally.[506]

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.

---

502 AER, *Explanatory statement—Rate of return guideline*, December 2013, pp. 23–24.

503 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.

504 Arsov, Brooks and Kosev, 'New measures of Australian corporate credit spreads', *RBA bulletin December quarter 2013*, December 2013.

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

506 Lally, *Implementation issues for the cost of debt*, November 2014.

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 G.

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 3-29, below, sets out the bond selection criteria for which we observe differences between the BVAL curve and the RBA curve.[507] 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.

[507] 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 3-29 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.[508]
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.[509] 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.[510]
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.[511] 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 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.[512]
Credit rating	Broad BBB (BBB-, BBB, BBB+) S&P bond rating if available, otherwise S&P	Only bonds with broad BBB credit rating are included. If available, Bloomberg composite	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.

508 Lally, *Implementation issues for the cost of debt*, November 2014, p. 9.
509 Lally, *Implementation issues for the cost of debt*, November 2014, p. 36.
510 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 9-10.
511 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 10-11.
512 Lally, *Implementation issues for the cost of debt*, November 2014, p. 36.

	issuer rating	rating is used, if not, either S&P, Moody’s or Fitch credit ratings are used, whichever is available	
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, and observed that:[513] ▪ 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.[514] ▪ Also, Lally observed that since the foreign bonds included in the RBA's 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.[515] This may occur due to differing perceptions across different markets of the default risk of Australian firms. ▪ The use of a bond index that includes foreign bonds implies that the assumed foreign-domestic bond mix will be weighted in proportion to their inclusion in the index rather than in proportion to 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.[516] ▪ 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.[517]

[513] Lally, *Implementation issues for the cost of debt*, November 2014, pp. 14-15.
[514] That is, the secondary market activity in such bonds is low, and most of the data is "indicative non-binding bid and offer quotes".
[515] Lally, *Implementation issues for the cost of debt*, November 2014, pp. 14-15.
[516] Lally, *Implementation issues for the cost of debt*, November 2014, pp. 14-15.
[517] Lally, *Implementation issues for the cost of debt*, November 2014, pp. 14-15.

			▪ 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.[518] 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 unlikely to be significant in the short term. However, this could plausibly change in the future, and the impact could become more significant.

Source: Lally, AER analysis

518 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 or the RBA curve is clearly superior.[519]

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[520] and REU,[521] the BVAL curve is a par yield curve, whereas the RBA curve is not. A par yield curve gives the yield for which the price of the bond is equal to its face (par) value.[522] This is equivalent to the task of setting the return on debt within a building block revenue framework.[523] For this reason, par yield curves are more appropriate for this purpose.[524] This favours the BVAL curve over the RBA curve.[525] However, as identified by Lally, the magnitude of difference between estimates is likely to be small and non-systematic in direction.[526]

- 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 smoothing step'.[527] 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

---

519 Lally, *Implementation issues for the cost of debt*, November 2014, pp.17-18.
520 Lally, *Implementation issues for the cost of debt*, November 2014, pp.17-18.
521 REU, *Return on debt estimation: a review of the alternative third party data series*, August 2014, p. 32.
522 Nasdaq, *Financial Glossary*, Available at: http://www.nasdaq.com/investing/glossary/p/par-yield.
523 Lally, *Implementation issues for the cost of debt*, November 2014. pp. 17-18
524 Lally, *Implementation issues for the cost of debt*, November 2014. pp. 17-18.
525 REU, *Return on debt estimation: a review of the alternative third party data series*, August 2014, p. 13.
526 Lally, *Implementation issues for the cost of debt*, November 2014. pp. 17-18.
527 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.

be small. On balance, we are not satisfied that either curve fitting (or averaging) methodology is clearly superior to the other.

Additionally, we understand that Bloomberg is likely to revise the BVAL methodology in late 2014 or early 2015. We also understand that these revisions would mostly impact the curve fitting methodology, rather than the bond selection criteria. Depending on the timing of these revisions, we intend to consider in the final decision any implications the updated methodology may have on our analysis of the BVAL methodology. If the updated methodology is active prior to the close of submissions on the draft decision, we encourage stakeholders to submit any comments they have on the updated methodology that they would like us to consider in the final decision.

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. Bloomberg has recently ceased publishing this curve to 7 years, and 5 years is now the maximum estimate published. But it has also indicated that it will soon revise its methodology which may result in the BVAL curve being published with 10 year estimates.
- 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, but we propose to interpolate between month end dates, where practical, in order to allow us to more closely 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.[528]
- We discuss our approach to implementation in greater detail later in this attachment.

Past performance

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

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.[529] 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.

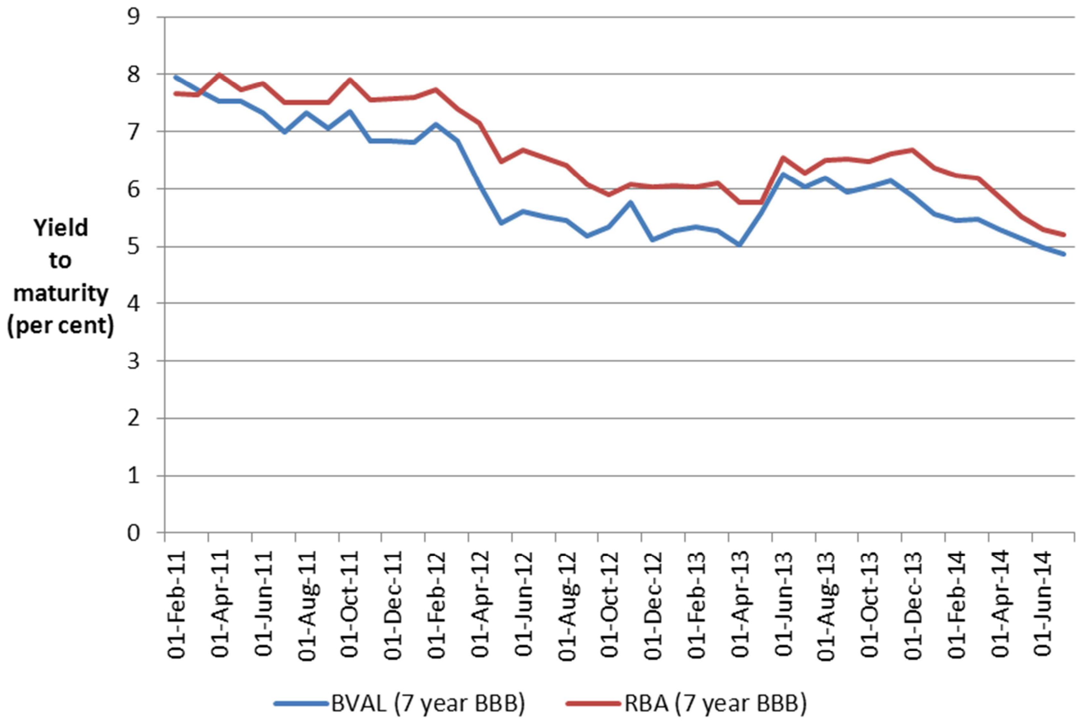
Further, even if sufficient data was available, it is not clear that this analysis would add much additional information to the technical characteristics assessment described above. The RBA and BVAL curves are a function of their bond selection criteria and curve fitting (or averaging) methodologies. 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 eachother, it is clear that they have produced substantially different results at different points in time. Figure 3-11, 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 backcasted 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.

---

[529] CBA, *Email to the AER—Re: CBASpectrum*, 19 August 2010.

Figure 3-11 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.[530] 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.[531]

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

[530] AER, *Explanatory statement—Rate of return guideline*, December 2013, p 130.

[531] 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.

clearly superior. Therefore, we will use the a combination of the two curves, adjusted as described later in this attachment, to estimate the annual return on debt. 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'.[532] Lally notes that 'the MSE is the average over the squared differences between the estimated value and the true value'.[533] The optimal estimator is that which results in the lowest MSE. This approach appears to have parallels in the rules, which require that:[534]

> 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 concludes 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.535 This is based on his observations that: [536]

- 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
- 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

JGN proposed selecting its preferred curve each regulatory year using a pre-defined process to determine which curve best fits a sample of bonds that match its pre-defined criteria.[537] We do not agree with this aspect of JGN's proposal. Rather, we have directly assessed the RBA and Bloomberg curves. From this assessment, we consider neither is clearly superior. Lally also reached this

532 Lally, *Implementation issues for the cost of debt*, November 2014, p. 19.
533 Lally, *Implementation issues for the cost of debt*, November 2014, p. 19.
534 NER cl. 6A.6.2(k)(1), NER, cl. 6.5.2(k)(1) and NGR, r.87(11).
535 Lally, *Implementation issues for the cost of debt*, November 2014, p. 22.
536 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 19-22.
537 JGN, *2015–20 Access arrangement information, Appendix 9.10: Return on debt proposal*, 30 June 2014, pp. 19, 23.

conclusion and recommended equally weighting the two indices to lower the mean squared error of the estimator.[538]

We have chosen to directly assess the RBA and Bloomberg curves. A direct assessment involves assessing the benefits and limitations of each data service provider's curve fitting methodology and bond selection criteria. This differs from an indirect assessment, which entails observing which curve better fits a chosen sample of bonds. We perform a direct assessment because direct assessments allow us to select which independent data service provider's curve (or combination of curves) to use before the access arrangement period commences. We consider this better facilitates the automatic updating of annual revenue. Our other reasons for adopting a simple average of the RBA and BVAL curves were set out above in this attachment.

In its access arrangement information, JGN also referred to a new issue premium. However it did not propose this to be included in its allowed revenue. Rather, JGN suggested we could apply an adjustment, 'if this bias is confirmed'. Since JGN did not establish the existence of this bias, we do not respond to this in detail here.[539]

Facilitates automatic updating

- Our approach of directly assessing the independent data service providers' curves allows us to specify which curve (or combination of curves) we will use before the access arrangement period commences. This allows us to apply these curves mechanistically throughout the access arrangement period. This process is consistent with the rules, which require annual revenue updates to occur via the automatic application of a formula specified in the determination.[540]
- If we were to indirectly assess the different curves against a benchmark sample of bonds, we would have to conduct the analysis annually. We consider this is likely to create difficulties. For instance, in assessing the merits of different curves, we consider it is important to apply an element of judgement. In its submission to our return on debt issues paper, APIA warned about uncritically accepting the results of such indirect assessments.[541] However, allowing an element of regulatory judgement into the annual updating process will likely cause the following difficulties:
- Increase the regulatory burden and annually re-open a debate that need not occur. Our draft decision on the annual debt update process is set in the debt update process section later in this attachment. This process is to occurs over a short timeframe.[542]
- Potentially conflict with the rules, which require annual revenue updates to occur via the automatic application of a formula.[543]
- Further, while it might be possible to indirectly assess the curves annually through a formulaic process set out in the access arrangement; we do not consider this a preferable option. This would entail applying a highly formulaic process to perform what is effectively, a qualitative

538 The mean squared error is the average over the squared differences between the estimated value and the true value. Lally, *Implementation issues for the cost of debt*, November 2014, p. 3.

539 JGN, *2015–20 Access arrangement information, Appendix 9.10: Return on debt proposal (public)*, 30 June 2014, p. 19.

540 NGR 87(12). See also NER 6.5.2(l) and 6A.6.3(l) for equivalent provisions in the NER.

541 APIA, *Submission on issues paper, Return on debt: Choice of third party data service provider*, 19 May 2014, p. 6.

542 Individual access arrangements set out the tariff variation process, which occurs over a short timeframe. This is similar to the electricity pricing proposal process, although the NER sets this out. The NER do not require DNSPs to submit their pricing proposals earlier than 2 months before the commencement of the second and each subsequent regulatory year of the regulatory control period (NER 6.18.2(a)). Further, the NER do not allow for a formal annual pricing approval process for TNSPs. These processes do not facilitate stakeholder consultation and provide more reason to apply automatic updating.

543 NGR 87(12).

assessment of the RBA's and Bloomberg's bond selection criteria and curve fitting methodologies. We are not convinced that conducting a qualitative assessment through a formulaic process is the best method before us. Further, if we were to apply an approach similar to what JGN is proposing, we would have to set our own bond selection criteria and averaging approach. This adds an additional layer of uncertainty and regulatory discretion. However, we have not seen any evidence that this would necessarily improve the final estimate. Rather, we consider this would diminish some of the main benefits of using a third party data series in the first instance.

Provides a better assessment

We prefer to directly assess third party data service providers' curves to identify which will better reflect a benchmark efficient entity's efficient financing costs. This differs from JGN's proposed indirect assessment that involves selecting the curve that best fits its pre-defined sample of relevant bonds.[544] JGN's proposed indirect assessment does not convince us for the following reasons:

- It is effectively an indirect assessment of the RBA's and Bloomberg's bond selection criteria and curve fitting methodologies. We do not consider an indirect assessment necessary, because we have already directly assessed the respective bond selection criteria and curve fitting methodologies. The Australian Competition Tribunal has recognised that both direct and indirect assessments are open to us. Regarding direct assessments, it advised:[545]

  > if there is sufficient available information, the AER could examine and compare the merits of the publishers' methodologies and data sources, as it has in the past.

- When direct and indirect assessments are both open to us, we consider a direct assessment to be preferable. This is because indirect assessments treat independent datasets as 'black boxes'. APIA has warned about uncritically accepting the results of such tests. This is because the relevant test involves decomposing differences between the benchmark and independent curves into differences from the bond selection criteria and curve fitting methodologies.[546]

- Even if we were to accept an indirect assessment, JGN would need to establish the merits of the criteria it uses to select its bonds for indirectly assessing the RBA and Bloomberg curves. We do not consider JGN has sufficiently established this. JGN has defined its sample in the broadest way, even though Bloomberg and the RBA already use generalised samples to construct their curves (see Table 3-30).[547] JGN appears to have based its reasoning on an Australian Competition Tribunal decision, where the Australian Competition Tribunal sought to ensure the sample of bonds was sufficiently large.[548] However, this was in the context of finding that a sample of five bonds was too small.[549] In fact, in that decision, the Australian Competition Tribunal accepted a sample of 38 bonds was, 'a complete enumeration of all possible relevant bonds'.[550] In contrast, JGN has now proposed a sample of 138 bonds.[551]

---

544 JGN, *2015–20 Access arrangement information, Appendix 9.10: Return on debt proposal*, 30 June 2014, pp. 19, 23.
545 Australian Competition Tribunal, *Application by ActewAGL Distribution [2010] ACompT 4*, 17 September 2010, para 77.
546 APIA, *Submission on issues paper, Return on debt: Choice of third party data service provider*, 19 May 2014, p. 6.Note this submission uses the term, 'agglomeration processes' where we use 'curve fitting methodologies'.
547 JGN, *2015–20 Access arrangement information, Appendix 9.10: Return on debt proposal (public)*, 30 June 2014, p. 20.
548 JGN, *2015–20 Access arrangement information, Appendix 9.10: Return on debt proposal (public)*, 30 June 2014, pp. 20–21.
549 Australian Competition Tribunal, *Application by Jemena Gas Networks (NSW) Ltd (No 5) [2011] ACompT 10*, 28 February 2011, paras 11, 69. This is with reference to Australian Competition Tribunal, *Application by ActewAGL Distribution [2010] ACompT 4*, 17 September 2010, paras 38–39.
550 Australian Competition Tribunal, *Application by Jemena Gas Networks (NSW) Ltd (No 5) [2011] ACompT 10*, 28 February 2011, para 79.
551 JGN, *2015–20 Access arrangement information, Appendix 9.10: Return on debt proposal (public)*, 30 June 2014, p. 29.

Table 3-30 sets out a comparison of the bond selection criteria used by the RBA, BVAL and proposed by JGN.

Table 3-30 Comparison of bond selection criteria

Bond characteristic	RBA sample [a]	BVAL sample [a]	JGN bond selection [b]
Size of issue / quality of pricing data	At least A$100 million (or equivalent)	BVAL score of 6 or higher , no retail size medium-term notes (MTN)	Any issue size
Residual term to maturity	Over 1 year	At least 2 months	Unspecified
Issuing entity	Non-financial corporations only, incorporated in Australia	Both financial and non-financial corporations , Australia is identified as the country of risk	Any industry, excluding governments or government bodies, incorporated in Australia
Secured / unsecured	Both secured and unsecured bonds	Unsecured senior bonds only	Unspecified
Credit rating	BBB+, BBB and BBB- rated: S&P bond rating, if available; S&P issuer rating otherwise	BBB+, BBB and BBB- rated: broad BBB Bloomberg composite bond rating, if available; broad BBB or equivalent from S&P or Moody's credit rating agency otherwise	BBB+, BBB, and BBB- rated: S&P rated
Currency of issue	AUD, USD, Euro	AUD	AUD, USD, Euro, British pounds
Coupon type	Fixed rate bonds only	Fixed rate bonds only	Any coupon type (including fixed and floating rate bonds)[552]
Embedded options	Both bullet bonds and bonds with embedded options.	Bullet bonds only	With or without embedded options
Other restrictions	Excludes bonds with some form of duplication and several credit wrapped securities	Outliers are detected and removed Restrictions on the number of bonds in the sample and subsamples by maturity	No duplicate bonds are included

Source: AER analysis, REU, Return on debt estimation: A review of the alternative third party data series: Report for the AER, August 2014, and JGN, 2015–20 Access arrangement information, Appendix 9.10: Return on debt proposal (public), 30 June 2014.

Choice of data series—Extrapolation and interpolation issues

As identified in the previous section, neither the RBA curve nor the BVAL curve is directly implementable in its published form. Both curves require additional adjustments to match more closely the efficient financing costs of a benchmark efficient entity. In line with the criteria in the Guideline,[553] we have considered these potential adjustments with regard to their fitness for purpose, their robustness and their simplicity. All adjustments will be specified in this decision and made via the automatic application of a formula.

552 JGN, *2015–20 Access arrangement information, Appendix 9.10: Return on debt proposal (public)*, 30 June 2014, p. 25.
553 AER, *Explanatory statement—Rate of return guideline*, December 2013, pp. 23–24.

This section sets out our analysis of our draft decision on the adjustments for the RBA and BVAL curves.

RBA curve

Table 3-31 below sets out our adjustments to the published RBA yield curve, including our reasons for the approach.

Table 3-31 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 ▪ all days interpolation is simpler to implement ▪ it is impractical to interpolate over business days for estimating the risk free rate, as this would require knowledge of trading days 10 years in advance ▪ the difference to the estimates between interpolating over business days or interpolating over all days is immaterial.[554] Where this is not practical due to timing, we will hold the last available RBA monthly estimate constant until the end of the averaging period. It would not be practical to linearly interpolate between two RBA monthly estimates where the allowed return on debt must be estimated and incorporated into the annual debt update process before the publication of the next RBA monthly estimate after the end of the averaging period. Our draft decision on the annual debt update process is set out in the annual debt update process later in this attachment.
Extrapolation to target term.	Yes	The 'effective term' of the RBA bond sample is commonly less than 10 years. For this reason, Lally recommended that the spread component of the yield should be extrapolated from its effective term at publication to the benchmark term (10 years).[555] In contrast, most service providers submitted that the entire yield should be extrapolated from effective term to the benchmark term.[556] 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.

554 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.

555 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

556 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, TransGrid, *Regulatory proposal*, June 2014, p. 178.

		However, we do not agree it is necessary to extrapolate the base component. As identified by the RBA and Lally,[557] the base component of the published 10 year yield already matches the benchmark term of debt. Therefore, extrapolating this component would result in overcompensation. 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.[558] Our benchmark sample consisted of service providers that were comparable to our definition of the benchmark efficient entity. We were therefore satisfied the average term at issuance for this sample was reflective of efficient financing costs. Similarly, from its earliest available publication to October 2014, the average effective term of the RBA's bond sample for its 10 year estimate is also 8.7 years.[559] 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. We encourage submissions from stakeholders on this issue, and may re-evaluate the need for this adjustment in the final decision or in future decisions.
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. 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'.[560] Therefore, this requires 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

Figure 3-12 below shows the impact of these implementation adjustments by plotting the RBA curve as published and the RBA curve including our draft decision adjustments.

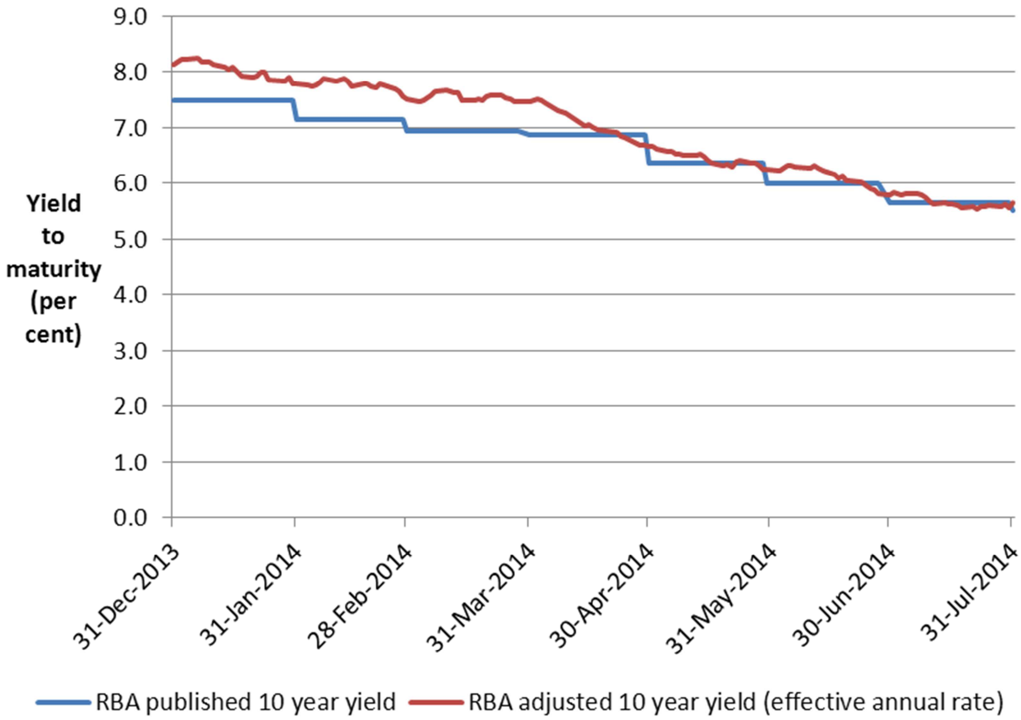
557 See the 'notes' tab in RBA, *Aggregate measures of Australia corporate bond spreads and yields*, available at: http://www.rba.gov.au/statistics/tables/xls/f03hist.xls; Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

558 AER, *Rate of return guideline—Explanatory statement*, December 2013, p. 136.

559 RBA, *Aggregate measures of Australia corporate bond spreads and yields*, available at: http://www.rba.gov.au/statistics/tables/xls/f03hist.xls.

560 RBA, *Email in response to: AER follow up question on the basis of YTM quotations in RBA statistical table F3*, 16 October 2014.

Figure 3-12 Impact of adjustments to the published 10 year RBA yields



Source: AER analysis, RBA

BVAL curve

Table 3-32 below sets out our adjustments to the published BVAL yield curve, including our reasons for the approach.

Table 3-32 Adjustments to the BVAL curve

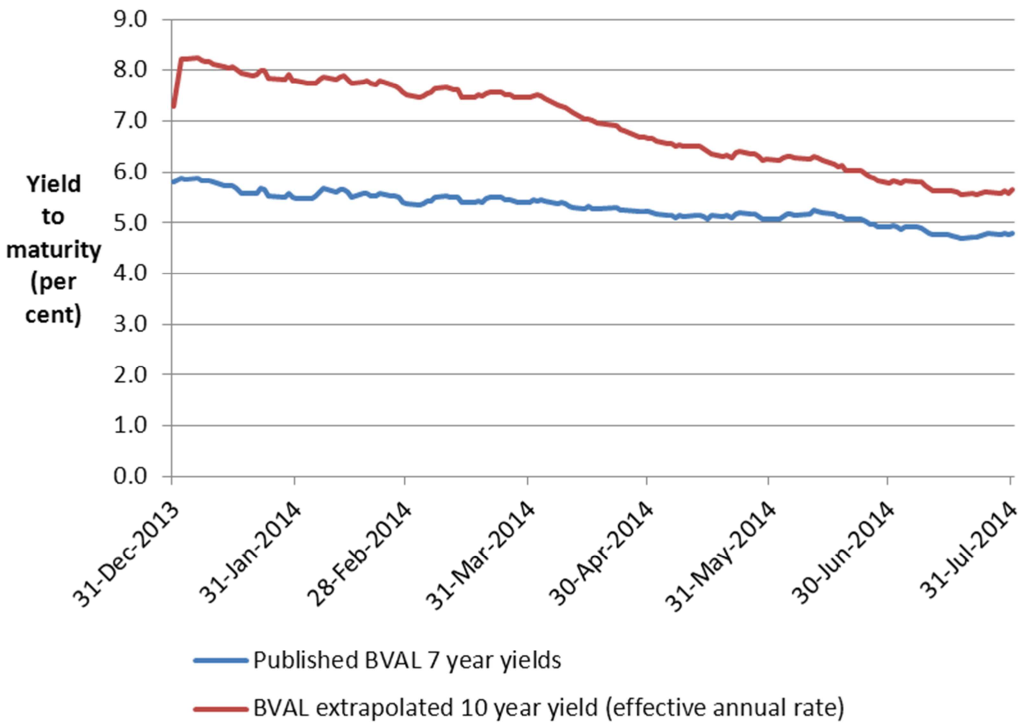
Adjustment Type	Amendment made?	Comments
Interpolation to construct daily estimates	No	Bloomberg publishes daily estimates.
Extrapolation to target term	Yes	During the averaging periods for 2014–15, the BVAL curve was only published to a 7 year term. We therefore extrapolate the spread component of the 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 estimate from 7 to 10 years. That is: BVAL yield $_{10\ years}$ = BVAL yield $_{7\ years}$ + difference in CGS from 7 to 10 years + difference in RBA extrapolated spread to CGS

		from 7 to 10 years As recommended by Lally,[561] we are satisfied this approach is comparably reliable to the more complex approaches submitted by other stakeholders,[562] but is simpler to implement and based on publicly available data. Additionally, we understand the updated BVAL methodology may include estimates to tenors of 10 years and longer. If the updated methodology is active prior to the final decision, we would consider any implications of this change on our draft decision position to extrapolate the Bloomberg curve from its maximum published tenor out to 10 years.
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.

Source: AER analysis

Figure 3-13 below shows the impact of these implementation adjustments by plotting the BVAL curve as published and the BVAL curve including our draft decision adjustments.

Figure 3-13 Impact of adjustments to the published 7 year BVAL yields



Source: AER analysis, Bloomberg, RBA.

561 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38–44.
562 Incenta, *Methodology for extrapolating the debt risk premium*, June 2014, pp. 2–3.

Choice of data series—Contingencies

We have made our draft 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 draft decision is to annually update the trailing average portfolio return on debt. Under the rules,[563] the change in revenue resulting from the annual update must occur by automatic application of a formula that is specified in the decision. 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 access arrangement period without the use of subsequent judgement or discretion. For this reason, we have set out a series of contingencies in Table 3-33, below. These describe how we propose to estimate the annual return on debt in the event of changes to data availability.

Table 3-33 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 final decision approach. We will consider any new data sources in future determinations.
Either Bloomberg or RBA substitutes its current methodology for a revised or updated methodology.	We will adopt the revised or updated methodology. Then, at the next regulatory determination, we will review this updated methodology. As noted above, we would also review any new data sources.
Bloomberg ceases publication of a 7 year BVAL estimate.	If Bloomberg still publishes the BVAL curve to 5 years, we will extrapolate the BVAL curve from 5 to 10 years using the 5 to 10 year yield margin from the RBA curve. If Bloomberg no longer publishes the BVAL curve to 5 years, we will rely entirely on the RBA curve.
The RBA ceases publication of a 10 year yield estimate.	If the RBA ceases publication of a 10 year yield estimate, we will extrapolate the RBA estimate to 10 years using: ▪ if available, the margin between spreads in the Bloomberg curve,[564] 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 resumes publication of a 10 year BVAL estimate.	We will apply the 10 year BVAL curve un-extrapolated, but still adjusted to be an effective annual rate.
The RBA commences publication	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

563 NER, cl. 6A.6.2(l), NER, cl. 6.5.2(l), and NGR, r. 87(12).
564 Specifically, the spread to CGS.

of daily estimates.	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 access arrangement 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, if Bloomberg commences publication of a 10 year BVAL curve, we would 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.[565] However, this is not possible during the access arrangement period. In these circumstances, we therefore are faced with the two alternatives of ceasing to rely on the updated curve, or temporarily relying on the updated curve on the basis that we have assessed the data provider as credible. As we are satisfied that both the RBA and Bloomberg are credible and independent, but not that either curve is clearly superior, we consider it is preferable that we adopt the updated curve to limit stakeholders' exposure to the distinct characteristics of a single curve. This is consistent with our position of placing weight on both curves to minimise the mean squared error.

Averaging periods

Our draft decision is to accept JGN's proposed debt averaging period for 2015–16.[566] Our draft decision is also to not accept JGN's proposal to nominate its averaging period after the start of the access arrangement period for years 2016–17, 2017–18, 2017–18, 2018–19 and 2019–20.[567]

In assessing JGN's averaging periods, we have applied the approach we proposed 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.[568] 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.[569] Table 3-34 sets out why we consider an averaging period that meets these conditions contributes to the achievement of the rate of return objective.

565 AER, *Explanatory statement—Rate of return guideline*, December 2013, pp. 23–24.
566 JGN, *2015–20 Access arrangement information, Appendix 9.2 averaging period proposal*, 30 June 2014, p. 1 (confidential).
567 JGN, *2015–20 Access arrangement information, Appendix 9.2 averaging period proposal*, 30 June 2014, pp. 3–4 (confidential).
568 AER, *Rate of return guideline*, December 2013, p. 21.
569 NER cl. 6.5.2(c).

Table 3-34 AER draft decision—Assessment of JGN's proposed averaging periods against Guideline conditions

Condition	Reasons for condition	Condition met?
It should be specified prior to the commencement of the access arrangement 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 tariff variation process, which is meant to be a compliance check that takes place over a short time frame.	Yes: 2015–16 No: 2016–17 2017–18 2018–19 2019–20
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 'game' the outcome and introduce an upward bias.[570]	Yes[571]
It should be as close as practical to the commencement of each regulatory year in an access arrangement period.	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, the period must typically end somewhat before this date to allow us to complete our regulatory tasks such as modelling and assessing compliance with JGN's tariff variation mechanism. It also allows sufficient time to complete our quality assurance checks.	Unknown
An averaging period needs to be specified for each regulatory year within an access arrangement period.	This allows for the annual debt update. The annual debt update reduces the potential for a mismatch between the allowed and actual return on debt for the benchmark efficient entity.	Not as yet
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[572]
The nominal return on debt is to be updated annually using the agreed averaging period for the relevant regulatory year.	This prevents a service provider from introducing bias by only updating annually using the agreed averaging period when it is advantageous for it to do so.	Not as yet
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.

570 Lally, *Expert Report of Martin Thomas Lally*, 13 February 2011, pp. 9–10.

571 JGN proposes notifying us of its proposed averaging period at least 50 business days prior to the start of the financial year in which the averaging period is to occur. JGN, *Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, p. 32.

572 JGN's process avoids overlap because it entails nominating an averaging period of at least 10 consecutive business days, falling entirely within the financial year immediately prior to the financial year that is to be used to calculate the annual return on debt observation. JGN, *Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, p. 32.

We have followed this approach in assessing JGN's averaging periods, by assessing them against the conditions in table 3-44. Our assessment is summarised in the table above. Our detailed assessment is set out in confidential appendix I on the rate of return averaging periods.

In the Guideline, we also proposed that averaging periods be determined as follows:[573]

- proposed by the service provider in its access arrangement information, and agreed to by us; or
- if we do not agree to the averaging periods proposed by the service provider, we would determine the averaging period and notify the service provider within a reasonable time prior to the commencement of the access arrangement period.

We have followed the former approach in determining JGN's averaging period for 2015–16. We have followed the latter approach in determining JGN's averaging periods for 2016–17, 2017–18, 2018–19 and 2019–20. We discuss this in further detail in confidential appendix I on the rate of return averaging periods.

For 2016–17, 2017–18, 2018–19 and 2019–20, JGN proposed to depart from the Guideline in relation to nominating all averaging periods before the start of the access arrangement period. Instead, JGN proposed to nominate these periods in a separate process each year.

Our draft decision is that JGN's averaging periods should be determined before the access arrangement period commences. We consider this condition to be consistent with a return on debt averaging period that contributes to the achievement of the rate of return objective. This is because we consider this:

- Provides service providers with sufficient flexibility to organise their financing arrangements. For instance, we provide service providers with the flexibility to nominate the length of their averaging periods, which can be between 10 business days and 12 months.
- Provides service providers with sufficient certainty to organise their financing arrangements. Agreeing to averaging periods upfront provides certainty that no matter how interest rates change, we will compensate service providers for the return on debt during that averaging period by reflecting those interest rates in their revenue allowance. This certainty provides service providers with confidence to organise their financing around the averaging periods they nominate.
- Results in an unbiased outcome. This is because it requires service providers to nominate their averaging periods in advance.[574]
- Assists in updating service providers' return on debt by automatic application of a formula specified in the determination, consistent with the rules.[575] This is because nominating averaging periods before the access arrangement period commences simplifies the annual updating process.

Conversely, in relation to the last point, JGN's proposal to add an additional process each year to determine its averaging periods adds further complexity and costs to the administration of regulation. This complexity would further increase if other service providers also proposed this approach. We may accept increased complexity where the benefits clearly outweigh the costs. For example, in the

[573] AER, *Rate of return guideline*, December 2013, p. 22.
[574] Lally observed that if a regulated business can select an averaging period by looking at historical yields, it may introduce an upward bias. Lally, *Expert Report of Martin Thomas Lally*, 13 February 2011, pp. 9–10.
[575] NER, clause 6.5.2(l).

Guideline, we adopted annual updating to the return on debt. While we recognised this would increase costs associated with complexity and the administration of regulation, we also considered the benefits would outweigh the costs.[576] In contrast, based on the reasons provided by JGN, we are not satisfied that there are benefits which outweigh the additional complexity resulting from JGN's proposal. Further, it is not clear to us that adding an additional process that requires judgement and assessment is consistent with the rule requirement for the change in revenue from the annual debt update to result from the automatic application of a formula that is specified in the determination.[577]

Annual debt update process

As noted above, 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'.[578] In considering what constitutes 'as close as practical', we considered how the process to annually update the return on debt would align with the annual reference tariff variation process. This is because the timing service providers submit their tariff variation proposal to us affects when the averaging period can end and still be implemented in practice.[579]

Table 3-35 outlines the general process we propose to adopt for the annual debt update for gas service providers. Our assessment of JGN's proposed averaging periods has taken this process into account. We also propose to adopt this process for assessing the proposed averaging periods of other gas service providers in the future. We encourage submissions from stakeholders on this process, including from service providers with future access arrangements.

Table 3-35 Annual gas debt update process

Step	Timing [a]	Description of step	Reasons for timing
1	25 business days before a service provider submits its annual reference tariff variation 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 service provider submits its annual reference tariff variation proposal to us.	So the service provider can factor this into its annual reference tariff variation 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 service provider submits its annual reference tariff variation proposal to us on the date determined in its	The service provider submits its annual reference tariff variation 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 service providers requiring a longer

576 AER, *Explanatory statement to the rate of return guideline*, 17 December 2013, p. 112.
577 NER, clause 6.5.2(l).
578 AER, *Rate of return guideline*, December 2013, p. 21.
579 JGN will submit its annual reference tariff variation proposal to us by 15 March of each year prior to the relevant financial year in which the proposed tariffs are to apply. This is consistent with its access arrangement information, which we accept in this draft decision. See JGN, *2015-20 Access Arrangement Information*, 30 June 2014, p. 130.

access arrangement.	period (or requesting a shorter period) to accommodate their internal processes.[580]

Source: AER analysis.

Note: a) JGN will submit its annual reference tariff variation proposal to us by 15 March of each year prior to the relevant financial year in which the proposed tariffs are to apply.

The process outlined in table 3-35 does not apply to the first year of the access arrangement period. This is because the final access arrangement 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 an access arrangement period.

In table 3-35, we propose calculating the return on debt, annual building block revenue requirement, and X factor in accordance with the formula in the final access arrangement. We propose informing JGN of our calculations before it submits its annual tariff variation proposal. We consider this preferable to the alternative approach, where we would assess the updates that JGN calculated itself. This alternative approach could significantly complicate the annual tariff variation approval process if we identify calculation errors and require JGN to revise all its proposed reference tariffs. On the other hand, our approach focusses the annual reference tariff variation approval process on how JGN has incorporated the revised X factor into its prices, rather than also assessing the revised X factor itself.

3.4.3 Gearing

Our draft 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 regulatory proposals currently before us, all service providers proposed a 60 per cent gearing ratio.[581] 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'.[582]

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). 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. However, 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.

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 3-36, as are the Bloomberg market valuations using the more recent data and Standard and Poor's book valuations. We observe that the average

580 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.

581 ActewAGL, *Revenue proposal*, July 2014, p. 254; Ausgrid, *Revenue proposal*, June 2014, p. 23; Directlink, *Revenue proposal*, June 2014, p. 36; Endeavour Energy, *Revenue proposal*, June 2014, p. 34; Essential Energy, *Revenue proposal*, June 2014, p. 30; JGN, *Access arrangement information*, June 2014, p. 98; TasNetworks, *Revenue proposal*, June 2014, p. 108; Transgrid, *Revenue proposal*, June 2014, p. 177.

582 Consumer challenge panel, *CCP1 submission to the AER re: the NSW DNSPs: Jam tomorrow?,* August 2014, p. 5.

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.

Table 3-36 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[583]

3.4.4 Expected inflation rate

We are satisfied with JGN's proposed method for forecasting inflation.[584] We base our approach on an average of the Reserve Bank of Australia's (RBA) short term inflation forecasts and the mid-point of the RBA's inflation targeting band starting from the 2015–16 regulatory year. Table 3-37 shows these estimates, which result in an inflation forecast of 2.55 per cent per annum.

Table 3-37 AER inflation forecast (per cent)

Forecast inflation	2015–16	2016–17 to 2023–24	Geometric average
AER draft decision	3.0 [a]	2.5	2.55

Source: RBA, *Statement on Monetary Policy*, November 2014, p. 61.
(a) In November 2014, the RBA published a range of 2.5–3.5 per cent for its June 2016 CPI inflation forecast. We select the mid-points from this range.

We expect the RBA to publish a more recent inflation forecast before our final decision, and we will update the value of the expected inflation rate accordingly in the final decision.

3.4.5 Fixed principle

JGN's proposed return on debt approach for its 2015–20 access arrangement period is consistent with the approach we proposed in the rate of return guideline.[585] Specifically, JGN's proposed return on debt approach is to apply the trailing portfolio average approach, with equal weights, annual updates and transitional arrangements. We accept JGN's proposed return on debt approach for the reasons set out in section 3.4.2.

In addition, JGN proposed the following fixed principle be added to its access arrangement:

> It is a fixed principle (as provided for in Rule 99 of the National Gas Rules) that the return on debt is estimated using a trailing average methodology which results in the return on debt (and consequently the allowed rate of return) being, or potentially being, different for different Financial Years in the Access Arrangement Period, unless the Service Provider otherwise consents to a different methodology being used. This fixed principle remains in force for the Access Arrangement Period covered by this Access Arrangement. This principle is also fixed for the next access arrangement period.[586]

Our draft decision is that we do not accept the inclusion of this fixed principle in JGN's access arrangement. JGN did not provide reasons for including this fixed principle in its access arrangement. Accordingly, we are not satisfied that the inclusion of this fixed principle in its access arrangement is consistent with the national gas objective.

3.5 Revisions

We require the following revisions to make the access arrangement proposal and access arrangement information acceptable.

---

583 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.

584 JGN based its approach on the approach we have applied to forecasting inflation in the past. See JGN, *Access arrangement information*, June 2014, p. 98. We note, JGN proposed inflation based on a base year of 2013–14 rather than 2014–15. We have corrected for this.

585 JGN, Access arrangement information, p.97; Access arrangement information, Appendix 9.10: return on debt, p.31; and JGN, Access arrangement proposal, June 2014, clause 5.1.

586 JGN, Access arrangement proposal, June 2014, clause 5.10, pp.21–22.

Revision 3.1: Make all the necessary amendments to the access arrangement proposal to reflect the values for the rate of return and its parameters set out in section 3.1 of attachment 3. This includes amending the value of the return on debt in clause 5.1 of the access arrangement proposal from 7.30 per cent to 5.93 per cent (subject to updating).

Revision 3.2: Make all the necessary amendments to clauses 5.2 to 5.9 of the access arrangement proposal to reflect our position set out in section 3.4.2 in attachment 3 and appendix I. In particular, reflect the annual debt update process and reflect our position that services providers are to nominate their averaging periods for the return on debt before the access arrangement period commences.

Revision 3.3: Make all the necessary amendments to clauses 378 to 413 of the access arrangement information to reflect our position set out in section 3.1 in attachment 3.

Revision 3.4: Make all the necessary amendments to all other clauses in the access arrangement information that refer to the rate of return to be consistent with our position set out in section 3.1 of attachment 3, including amending clause 17.

Revision 3.5: Make all the necessary amendments to confidential appendix 9.2 to be consistent with confidential appendix I of attachment 3. In particular, amend clauses 10 to 17 to reflect our position that services providers are to nominate their averaging periods for the return on debt before the access arrangement period commences.

Revision 3.6: Make all the necessary amendments to references concerning debt raising costs to be consistent with section H.2.1 of appendix H of attachment 3, including amending clauses 132, 329 and 334.

Revision 3.7: Make all the necessary amendments to appendix 9.3 of the access arrangement information to be consistent with our position set out in sections 3.1, 3.4.1 of attachment 3 and its appendices A to G.

Revision 3.8: Make all the necessary amendments to appendix 9.10 of the access arrangement information to be consistent with our position set out in sections 3.1, 3.4.2 of attachment 3 and its appendix, G.

Revision 3.9: Make all necessary amendments to reflect our draft decision, specifically, to delete the return on debt fixed principle (section 5.10) from JGN's access arrangement proposal.

A Equity Models

A.1 Relevant asset pricing models

During the Guideline process we focused on four key models that might be used to estimate the return on equity (RoE), or to inform the to inform the implementation of our foundation model approach:

1. The Sharp–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 of these models were relevant information we should consider. We remain of the view these models are relevant and have had regard to them in this decision.

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). We consider these models are also relevant information and we have had regard to this information and these models in this decision.

A.2 Role of relevant models

At the time we developed the Rate of Return guideline (the Guideline) the merits of the SLCAPM, the Black CAPM, the FFM, and the DGM were assessed against our criteria set out in the Guideline. Guided by our criteria we then determined the appropriate role for each model to ensure our estimate of the return on equity achieved the rate of return objective.[587] We did not assess alternative (non-standard) versions of the SLCAPM separately against our criteria.

The foundation model approach, utilising the SLCAPM as the foundation model, was developed taking into account a range of considerations covered in the Explanatory Statement to the Guideline.[588] Most importantly, at the time we published the Guideline we expected the application of the foundation model (using the SLCAPM as foundation model) to result in an estimated RoE that would lead to a rate of return (RoR) that would meet the allowed rate of return objective (RoR objective).

The network service providers (NSPs) have submitted further material in support of alternative uses for the models above. Having assessed this material, we have determined to continue to use the SLCAPM as the foundation model. We have also determined to use the other models as we indicated we would at the time we published the Guideline. After carefully 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.[589] We have not used these criteria determinatively and our overarching consideration in determining the use for a model is what use will help achieve the RoR objective. While we did not do

---

587 AER, *Explanatory statement rate of return guideline*, 17 December 2013, p 58

588 AER, *Explanatory statement rate of return guideline*, 17 December 2013, pp. 54-56

589 AER, *Explanatory statement rate of return guideline*, 17 December 2013, pp24-30.

this when we published the Guideline, for this 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.

While the key reasons for our use of the different models are covered in the reasons for draft decision section of this attachment, further considerations in relation to each of the six models above are covered below.[590]

A.2.1 Sharpe–Lintner CAPM

The Sharpe–Lintner Capital Asset Pricing Model (SLCAPM) is an equilibrium asset pricing model. It is based on the well accepted finance principle rational investors will seek to minimise risk (as measured by portfolio variance) for a given expected return.[591]

As discussed in the reasons for draft decision section of this attachment, we consider the SLCAPM will, as the foundation model in our foundation model approach, result in a RoE that leads to a RoR that meets the RoR objective. We consider this is the case for the reasons set out in this decision and in the Explanatory Statement to the Guideline and Appendices to the Explanatory Statement.[592] In coming to this conclusion we and our consultants have carefully considered the material submitted to us post the publication of the Guideline. This has included full consideration of the NSPs proposals and submissions on these proposals.

The SLCAPM is the dominant model used to estimate firms' cost of capital by providers of capital to firms (i.e. investors). We consider the SLCAPM:

- 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; and
- 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 despite these challenges. 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 as it should reflect a reasonable estimate of the required rate of return in the market. We consider the cross checks on the RoE, using other information as set out in this decision, also provide supporting evidence the RoE derived using the SLCAPM based foundation model as we have applied it will lead to a RoR that meets the RoR objective.

---

590 Material is often repeated in the reasons for our decision and in the appendix to provide context for other material covered here in more detail.

591 The model is covered in many university texts. See for example: Peirson, Brown, Easton, Howard and Pinder, Business Finance, McGraw-Hill, Ninth edition, 2006, pp200-207.

592 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp10-14.

A significant amount of the material submitted by the NSPs commented on our conclusions and choice of SLCAPM as the foundation model. Generally, the NSPs considered the standard SLCAPM was likely to provide downward biased estimates of the RoE of the benchmark efficient entity.

We do not agree with these submissions for the reasons stated in the reasons for the draft decision section of this attachment. Our consultants supported both our use of the foundation model approach in the Guideline and the use of the SLCAPM as the foundation model.[593]

Submissions regarding the SLCAPM as foundation model

A number of NSPs have submitted that the allowed rate of return on equity for a benchmark efficient entity from the Foundation Model approach (when using the SLCAPM as a base model) is likely to be downward biased.[594] These NSPs have submitted that the estimate of the rate of return on equity for a benchmark efficient entity can be improved through the use of estimates from different models and other information relative to the Foundation Model approach (using the SLCAPM as the foundation model). [595] These NSPs appear to have submitted the downward bias is due to improper consideration of relevant material in either:

- Forming a view on the appropriate parameter values to use in applying the Foundation Model approach (i.e. values for the risk free rate, market risk premium and equity beta).[596] For example, Ausgrid, Endeavour Energy and Essential Energy (NSW DNSPs) have submitted the AER should consider benchmark cost of equity estimates from the Fama-French model (FFM) when setting the return on equity[597], must take account of empirical estimates of the Black CAPM[598], and that DGM estimates of the required return on equity are likely to improve estimates of the required return on equity.[599]
- In using the Foundation Model approach at all (which uses the SLCAPM as a foundation model).[600]

593 John C. Handley, *Advice on return on equity,* 16 October 2014, p4; 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, pp9-14

594 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp80-84; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, pp 119-126 ; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014*, pp105-112; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p186; ; ActewAGL Distribution, *Regulatory Proposal 2015-19 Subsequent regulatory control period*, 2 June 2014, p267; TasNetworks, Regulatory Proposal, 2014, p107; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.

595 TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp 12,185,195; Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p79-80; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019, 30 May 2014*, pp 117-120 Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp 103-105 ; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2

596 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp83-85; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, pp124- 129 ; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014*, pp110-115 ; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.

597 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p84; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, p127 ; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p113.

598 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p83 Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, p125 ; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p111.

599 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p85; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, pp 128-129; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019,* 30 May 2014, pp114-115.

600 TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp185-187, 194; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2

A number of NSPs then appear to have submitted, directly or implicitly, that any adjustment the AER has made to input parameters in the SLCAPM (in applying the Guideline foundation model approach) is not sufficient to overcome the downward bias in the SLCAPM.[601]

The key information the NSPs base these propositions on includes: studies of ex post performance of the SLCAPM; empirical and theoretical information related to the estimation of the SLCAPM input parameters (particularly in relation to equity beta); and other direct estimates of the RoE from alternative sources to the SLCAPM.

We have considered the key submissions on these points in the relevant sections of this decision. We do not consider that they support that any further adjustment to our SLCAPM input parameters is required to meet the RoR objective. The proposition that our RoE estimate is too low and will not fairly compensate a benchmark entity facing a similar degree of risk to the NSP (that this draft decision applies) for its efficient equity financing costs is also not supported.

Other stakeholders have supported the use of the SLCAPM as the foundation model,[602] while a number have submitted that we should consider lowering our SLCPAM input parameters relative to those published with the Guideline.[603] A number of stakeholders propose, based on the empirical evidence from the 2014 beta report for the AER by Professor Olan Henry (Henry), that the equity beta should be lowered below 0.7.[604] Table 3-38 summarises a number of these submissions. We consider these submissions support the use of the SLCAPM and that its use with our chosen input parameters should lead to a RoR that meets the RoR objective.

Table 3-38 Submissions related to the RoE models

Stakeholder	Submission
CCP1	'The Guideline requires use of the Sharpe-Lintner CAPM as the foundation model, with the Black CAPM and dividend growth models used to inform estimates for the equity beta and market risk premium. The Guideline specifically states that the Fama-French three factor model has no role in estimating return on equity. The DNSPs have proposed using the Fama-French three factor model. The CEG report provided by the DNSPs notes that the Fama French model 'is well-accepted in the finance literature and the results of the model should be considered relevant information for the purposes of assessing the cost of

601 TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p187; ; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p268; Ausgrid, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, p84; Endeavour Energy; Regulatory Proposal 1 July 2015 to 30 June 2019, 30 May 2014, p126; Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp111-112; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p40.

602 Consumer Challenge Panel 1 - Submission on NSW DNSPs regulatory proposals 2014-19, 15 august 2014, pp14-15; MEU, Submission on TasNetworks' revenue proposal, 8 Aug 2014, p36; Energy Markets Reform Forum, Submission on DNSPs regulatory proposal, 8 August 2014, p32

603 Consumer Challenge Panel 1 - Submission on NSW DNSPs regulatory proposals 2014-19, 15 august 2014, pp15-17; MEU, Submission on TasNetworks' revenue proposal, 8 Aug 2014, pp32-34; Bell Bay Aluminium, Submission on TasNetworks revenue proposal, 8 Aug 2014, p3; Tasmanian Small Business Council, Submission on TasNetworks revenue proposal, 8 August 2014, p42; Norske Skog Paper Mills, Submission on TransGrid's revenue proposal, p8; Origin Energy, Submission on DNSPs regulatory proposal (attachment 1), 8 August 2014, p1; 603 EUAA, Submission to TasNetworks' revenue proposal, 8 Aug 2014, p8; EUAA, Submission on TransGrid's revenue proposal, 8 August 2014, pp8-9.

604 Consumer Challenge Panel 1 - Submission on NSW DNSPs regulatory proposals 2014-19, 15 august 2014, pp15-17; MEU, Submission on TasNetworks' revenue proposal, 8 Aug 2014, pp32-34; Bell Bay Aluminium, Submission on TasNetworks revenue proposal, 8 Aug 2014, p3; Norske Skog Paper Mills, Submission on TransGrid's revenue proposal, p8; Origin Energy, Submission on DNSPs regulatory proposal (attachment 1), 8 August 2014, p1; EUAA, Submission to TasNetworks' revenue proposal, 8 Aug 2014, p8; EUAA, Submission on TransGrid's revenue proposal, 8 August 2014, pp8-9

	equity under the NER. In developing its Guideline, the AER had regard to the NER, took into account feedback from extensive consultation, decided against using this model this model, and provided its reasons for this decision. We can see no clear evidence from the DNSPs to support straying from the Sharpe-Lintner CAPM and therefore suggest that the AER does not admit the Fama-French model into its cost of equity considerations.'[605]
PIAC	PIAC has submitted in relation to the DNSP approach [which is significantly different to the guideline in the models used] that it varies from the relatively straightforward calculation of the forward-looking SLCAPM and introduces considerable complexity and uncertainty.[606]
Energy Markets Reform Forum	Energy Markets Reform Forum has submitted that DNSPs have regurgitated arguments put during the Guideline development process and the conclusions drawn during this process have been effectively overlooked. It has submitted no new information has been provided by the DNSPs to justify the use of other models that might otherwise lead to a variation in the assessment the AER made in the development of the Guideline. Energy Markets do accept that new information has been submitted by TransGrid in the form of Grant Samuel assessment of the valuation of Envestra.[607]
Origin Energy	Origin Energy has urged the AER to exercise its judgement when setting SLCAPM input to select parameters at the bottom of ranges permitted within the framework where these estimates would more closely approximate the networks' true funding costs.[608] It submits the proposed WACCs for both TransGrid and the NSW DNSPs appear excessive given TransGrid is a monopoly businesses under a revenue cap with a pass through mechanism covering multiple events while the NSW DNSPs are providing an essential services with no volume risk and with a pass through mechanisms covering unexpected cost increases.[609] With respect to ActewAGL, Origin notes ActewAGL is under a revenue cap, has an unders and overs mechanism and has cost through provisions in the event of unforseen events resulting in it facing a substantially lower level of risk than the level proposed by ActewAGL. On this basis, Origin disagrees with the proposed RoE of 10.71 per cent is commensurate with the risk faced by ActewAGL.[610]
AGL	AGL has submitted with respect to the NSW DNSPs that the AER should enforce its rate of return guideline as good regulatory principle because it seems to provide a realistic benchmark rate of return for a low risk, regulated monopoly asset.[611]
The Energy Users Association of Australia (EUAA)	EUAA submits that while supportive of the Better Regulation program and the associated Guidelines, EUAA members are of the view that the return on investment is very generous for the low level of risk faced by network regulated businesses. The EUAA encourages the AER to revisit some input parameters, particularly the market risk premium and the equity beta to

605 Consumer Challenge Panel 1 - Submission on NSW DNSPs regulatory proposals 2014-19, 15 august 2014, pp14-15.
606 Public Interest Advocacy Centre, Submission on DNSPs regulatory proposal, 8 August 2014, p74.
607 Energy Markets Reform Forum, Submission on DNSPs regulatory proposal, 8 August 2014, pp34-35; Energy Markets Reform Forum, Submission on TransGrid's regulatory proposal, 8 August 2014, pp30-31
608 Origin Energy, Submission on TransGrid's revenue proposal, 8 August 2014, p1; Origin Energy, Submission on DNSPs regulatory proposal (attachment 1), 8 August 2014, p1
609 Origin Energy, Submission on TransGrid's revenue proposal, 8 August 2014, p1; Origin Energy, Submission on DNSPs regulatory proposal (attachment 1), 8 August 2014, p1.
610 Origin Energy, Submission in response to ActewAGL 2014-19 Regulatory Proposal, 20 Aug 2014, p4.
611 AGL, Submission on DNSPs regulatory proposals, 8 August 2014, p19.

	provide a balanced point allocation within the parameters ranges mooted by the AER to date.[612] [613]
Norke Skog Paper mills	Norske Skog Paper mills has submitted with respect to TransGrid that the AER should reduce it guideline beta estimate down from 0.7 to the median estimate in Henry's beta work for the AER published in 2014. It considers 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 by the AER.[614]
Major Energy users	Major Energy Users submitted that the AER when setting the RoE for TasNetworks should use an equity beta for equity in the SLCAPM calculation consistent with the work in Henry's 2014 report for the AER. It indicates it considers this work supports a benchmark entity having a beta closer to the median value (0.3285) than the average of individual firm values (0.5223).[615] It submits that while TasNetworks has followed the AER Guideline, adjusting the risk free rate to current level, adjusting the cost of debt to current levels and using the lower equity beta implied by Henry in his latest report would lower the WACC by more than 1 per cent and would reduce revenue by nearly 10 per cent.[616]
Bell Bay Aluminium	Submits that while TasNetworks proposed WACC is a lesser amount than allowed by the AER and that TasNetworks has followed the AER Guideline, the AER should review the parameters in table 10.1 of the revenue proposal, and particularly considers both the MRP and beta could be reduced (from 6.5 per cent and 0.7). It notes the AER Guideline indicates 6 per cent is more appropriate for the MRP and the equity beta has a range of 0.4 to 0.7.[617]

NSP Submissions our RoE is too low

The majority of NSPs have submitted that the SLCAPM is downward biased for stocks with a beta of less than one.[618] This has been supported by sections in expert consulting reports from CEG Consulting[619], SFG Consulting[620], and NERA Consulting.[621] A key argument made in all reports is that empirical tests of the SLCAPM reject the SLCAPM and 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).[622] The NSW DNSPs also

612 Energy Users Association of Australia, Submission to TasNetworks revenue proposal, 8 Aug 2014, p8.
613 Energy Users Association of Australia, Submission on TransGrid's revenue proposal, 8 August 2014, p8
614 Norske Skog Paper Mills, Submission on TransGrid's revenue proposal, p8.
615 MEU, Submission on TasNetworks'' revenue proposal, 8 Aug 2014, pp33-34.
616 MEU, Submission on TasNetworks'' revenue proposal, 8 Aug 2014, p4.
617 Bell Bay Aluminium, Submission on TasNetworks revenue proposal, 8 Aug 2014, p3.
618 Ausgrid, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, p80; Endeavour Energy; Regulatory Proposal 1 July 2015 to 30 June 2019, 30 May 2014, p120; Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, p106; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p191; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p262 ; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p12.
619 CEG, *WACC estimates: A report for NSW DNSPs*, May 2014
620 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
621 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014
622 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, pp21-24; NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, pp82-84.

put in a submission in response to our issues paper on its regulatory proposal.[623] This submission, while not appearing to raise new material, has been considered as part of this decision.

The material submitted by the NSPs is largely not new, and the arguments around potential bias in the SLCAPM were considered during the Guideline development process.[624] At this time we concluded that the evidence was unclear given the empirical limitation of the tests and, notwithstanding potential limitations with the model, we considered that our implementation of the model recognised any potential empirical limitations.[625]

Following the submission of the NSPs proposals, as noted above, we engaged Associated Professor Graham Partington and Professor Michael McKenzie (McKenzie and Partington) to review the NSPs' proposals and the experts reports submitted in support of these proposals. We also engaged Associated Professor John Handley (Handley) do a high level review of our foundation model approach taking into account Partington and McKenzie's report, the NSPs proposals, and three key expert reports[626] submitted by the NSPs in support of their regulatory proposals.

In relation to the SLCAPM, McKenzie and Partington found the following:[627]

- 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 and note 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 CAPM 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: the cross section of returns is only one dimension of interest.
- The evidence against the CAPM may not be as robust as once thought when more appropriate statistical tests are used.
- The empirical evidence against the model does not invalidate its use for estimating the cost of capital for projects when making capital budgeting decisions.

McKenzie and Partington also consider that the Black CAPM is not based on more realistic assumptions and further, that the empirical results for the Black CAPM and SLCAPM are not directly comparable.[628]

623 NSW DNSPs, Submission on the AER issues paper (attachment 1), 8 August 2014.
624 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp11-13.
625 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp11-12.
626 The three expert reports Handley was asked to examine were CEG, *WACC estimates: A report for NSW DNSPs*, May 2014, pp; 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
627 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, pp9-10.

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 capital. The benchmark firm is not average risk and its risk is not expected to change given its regulated monopoly nature providing services with highly inelastic demand. Empirical evidence by Professor Henry supports this and shows no clear evidence of mean reversion of risk towards the average risk of the market. This is discussed further in the equity beta appendix.

McKenzie and Partington confirmed the view they expressed prior to the publication of the Guideline that they consider the equity beta of the benchmark firm is likely to be very low and reject the NSPs' consultants issues with the analysis in their 2012 report[629] as unfounded.[630]

McKenzie and Partington express the concluding opinions that the foundation model approach, using the SLCAPM as the foundation model, would be expected to:[631]

- lead to a reasonable estimate of the RoE;
- lead to a RoR that meets the RoR objective; and
- not lead to a downward biased estimate of the cost of equity capital for a benchmark efficient entity.

While McKenzie and Partington note that the addition of RoE estimates from other models might lead to a materially better estimate of the RoE, they state that they 'have significant reservations about the implementations of the models as proposed by the network service providers'[632].

Associate Professor Handley indicated our use of the SLCAPM as foundation model entirely appropriate and reasonable.[633] He noted that '[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.'[634]

The views of Handley and McKenzie and Partington that the SLCAPM is the standard asset pricing model among market practitioners are supported by the evidence from broker and valuation reports. All but one of the broker and valuation reports we examined used the SLCAPM as the primary model for estimating the return on equity.[635]

---

628 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, pp22-23.

629 McKenzie, M. and G. Partington (2012) “Report to the AER: Estimation of the Equity Beta (Conceptual and Regulatory Issues) for a Gas Regulatory Process in 2012”, April 3 2012.

630 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, pp10-13

631 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, pp13-14

632 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, pp9.

633 John C. Handley, *Advice on return on equity,* 16 October 2014, p4.

634 John C. Handley, *Advice on return on equity,* 16 October 2014, p4.

635 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; *Financial Services Guide*

In relation to our choice of input parameters to the SLCAPM, we consider that our input parameters result in a RoE that is will lead to a RoR that meets the RoR objective for the following reasons:

- 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 (discussed further in the reasons for the draft decision section);
- our MRP of 6.5 per cent is a fair estimate of the required return on the market having regard to all the information before us (discussed further the reasons for the draft decision section and the MRP appendix); and
- 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 (discussed further in the reasons for the draft decision section and the equity beta appendix).

Having had regard to the NSPs' proposals currently before us, submissions and our consultants advice, we remain of the view the evidence is not compelling the SLCAPM will systematically underestimate the RoE for the benchmark efficient entity.

Our assessment against our assessment criteria is set out in the reasons for draft decision.

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 RoE estimate that leads to an allowed RoR that meets the RoR objective. We do not consider the use of the SLCAPM as the foundation model will result in a downward biased estimate of the cost of equity capital. We consider the NSPs various proposed alternatives to estimating the SLCAPM input parameters, or to the foundation model itself, will result in estimates of the RoE that will not result in a RoR that meets the RoR objective.

While we acknowledge the SLCAPM has weaknesses, we note:

- we remain of the view that the SLCAPM is the clearly superior model to use as the foundation model (at this time) and we agree with our consultants that the evidence against the model is far from clear. 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 either the MRP or the equity beta. Our selection of input values for the MRP and equity beta are covered in step three of our foundation model approach; and
- we have applied the SLCAPM in a measured manner in choosing an equity beta well above the best econometric estimate implied from Henry's 2014 report. We note our beta of 0.7 is generally below the equity beta the NSPs and their consultants consider appropriate (typically between 0.82 and 0.94) and is above the beta a number of large energy users consider appropriate given the risk of the NSPs.

---

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.

We consider the SLCAPM is appropriate as a foundation model to use to estimate the RoE of the benchmark efficient entity. We consider its use in this context will lead to a predictable estimate of the RoE, and this will be valuable in ensuring the regulated firms can efficiently raise equity capital. The key reasons for using the SLCAPM as our foundation model remain unchanged from the reasons stated at the time of the publication of the Guideline: [636]

- 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. Input parameter estimates are supported by robust, transparent and replicable analysis.
- 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 value.
- The SLCAPM can be used to 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.

We note McKenzie and Partington have now indicated the Black CAPM (of itself) does not justify any uplift to the estimated equity beta to be used in the SLCAPM.[637] Nevertheless, we consider the model does theoretically demonstrate that market imperfections could lead to the SLCAPM generating RoE estimates that are too high or too low. We have taken this into account in exercising our regulatory judgment in choosing to use an equity beta of 0.7 in the SLCAPM. This is the equity beta we indicated we would use at the time we published the Guideline.

We also acknowledge an equity beta of 0.7 is well above the fixed weight portfolio and average of individual firm equity beta estimates in Henry's 2014 report.[638] However, in using an equity beta of 0.7 in applying the SLCAPM, we have exercised our regulatory judgment taking into account a range of information beyond the empirical beta estimates. We have selected an equity beta point estimate of 0.7 because we consider will this lead to a RoR that meets the RoR objective and best advances the RoR objective. We consider this is appropriate in all the circumstances.

[636] AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp13-14.

[637] 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, p24

[638] Henry, *Estimating β: An update*, April 2014

A.2.2 Fama French Three Factor Model

The Fama French Model (FFM) is a three factor model of asset returns.[639] It incorporates the following three risk factors[640]:

- the return on the market (thus it incorporates the CAPM's systematic risk factor by having the return on the market as a factor);
- firms size (measured by market capitalisation); and
- the ratio of book value to market value.

At the time we published the Guideline, based on the information before us at the time, we determined the FFM would be given no role in estimating the return on equity for a benchmark regulated service provider. Having fully reviewed the NSPs' proposals and supporting documents, we remain of the view that the FFM should not be used for determining the regulatory RoE at this time for the reasons set in the Explanatory Statement to the Guideline and Appendices to the Explanatory Statement[641] and below. We do not consider its use will result in a RoE estimate that leads to an allowed RoR that meets the RoR objective. Our consultants, McKenzie and Partington, having also fully reviewed the NSPs' proposals and supporting documents, support our decision to not use the model.[642] We consider Handley's comments on the model also support our decision to not use the model.[643]

The key reasons for giving the FFM no role at the time of the publication of the Guideline were:[644]

- There is little evidence of the use of the FFM either by companies to estimate their cost of capital or by regulators.
- Empirical implementation of the FFM is relatively complex and opaque and estimates are sensitive to the choice of estimation period and methodological assumptions. The two key points raised were:
  - Estimates of the value and size factors vary considerably suggesting 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, as well as 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 actually mean these factors are priced ex-ante (on a forward looking basis).

---

639 Fama, E.F. and French, K.R., The cross section of expected stock returns, The journal of finance, 47, 1992, pp427-66.

640 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, pp15-16.

641 AER, *Rate of return guideline*, 17 December 2013, p13 AER, *Explanatory statement rate of return guideline*, 17 December 2013, pp57-72 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp18-23.

642 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,pp15-19.

643 John C. Handley, *Advice on return on equity,* 16 October 2014, pp7-10.

644 AER, *Explanatory statement rate of return guideline*, 17 December 2013, pp57-72 ; AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp18-23.

Other than in the proposals from the NSPs (including consulting documents supporting these proposals) and from our consultants, there is only one submission directly in relation to using the FFM to estimate the RoE. One consumer challenge panel indicated they did not see any clear new evidence relative to the material considered when developing the Guideline where the AER stated its reasons for not using the model, and the model should therefore not be used.[645]

The majority of NSPs have argued that empirical estimates from the FFM should be used for estimating the return on equity capital.[646] The NSPs then use their empirical estimates of the RoE from the FFM to do one or more of the following:

- estimate their proposed RoE (as part of a multi model approach)[647]
- to provide evidentiary support that their estimate of the RoE is reasonable and will lead to a RoR that meets the RoR objective[648]
- to provide evidence the foundation model approach as set out in the Guideline will not lead to a RoR that meets the RoR objective.[649]

The NSPs have variously responded to key stated reasons for giving the FFM no role at the time of the publication of the Guideline principally through providing reports by SFG Consulting[650] and NERA Consulting.[651] SFG have indicated directly in response to our Guideline reasoning:

- the AER's position that the model is relatively complex and opaque and estimates from the model are sensitive to the choice of estimation periods and methodological assumptions are not valid reasons to not use the model[652]
- the AER is 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[653]

645 Consumer Challenge Panel, Submission on the NSW DNSPs regulatory proposal 2014-19, pp14-15.

646 Ausgrid, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, p79; Endeavour Energy; Regulatory Proposal 1 July 2015 to 30 June 2019, 30 May 2014, p119; Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, p104; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p12; ; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p261; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p1.

647 TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp12-13; ; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p274; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2

648 Ausgrid, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, p79; Endeavour Energy; Regulatory Proposal 1 July 2015 to 30 June 2019, 30 May 2014, pp119-120; Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp104-106; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp188-190; ; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, pp273-276; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.

649 Ausgrid, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp79,84-85; Endeavour Energy; Regulatory Proposal 1 July 2015 to 30 June 2019, 30 May 2014, pp119,126-1127; Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp104,112-113; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p191; ; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, pp262; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.TransGrid

650 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, pp33-37; SFG Consulting, The Fama-French model Report for Jemena Gas Networks; ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, May 2014, pp17-32 .

651 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, pp96-103.

652 SFG Consulting, The Fama-French model Report for Jemena Gas Networks; ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, May 2014, pp23-26.

653 SFG Consulting, The Fama-French model Report for Jemena Gas Networks; ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, May 2014, pp20-21.

- the AER's position that the lack of theoretical foundation for the model suggest the model may be unstable as well as the disappearance of the size effect may reflect this lack of theoretical foundation are not clearly correct and/or valid reasons to reject the use of the model[654]
- the AER's 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.[655]

In response to these NSPs' submissions on the models stability, we consider the variation in estimates of the FFM discussed in the Guideline suggests that such estimates are highly sensitive to the chosen methodology. As noted in reasons for the draft decision section, this conclusion is reinforced by a recent study in the UK by Michou, Mouselli and Stark (2014).[656] Surveying the research literature on the FFM, this study identifies a variety of different methodologies used to estimate the FFM in the UK and it finds that different methodologies generate substantially different results. A principal conclusion of Michou, Mouselli and Stark is 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 considered carefully in empirical settings'.[657] 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) note with respect to the model specification choices around break points in the model: 'what appears to be relatively innocuous choices in portfolio construction can lead to substantially different conclusions.'[658] Brailsford, Gaunt and O'Brien (2012) explain why their results are different from other studies which find a positive size premium in Australia and in particular, they draw attention to how their results depend on the specific methodology that they use.

While SFG argue that one methodology is superior to other methodologies,[659] we disagree. We consider there is no agreed best methodology. Our position is supported by McKenzie and Partington who question what the objective criteria to determine the best studies are.[660]

On our position that the FFM is complex to implement (relative to the SLCAPM), the NSPs have submitted:

- 'the regulator would need to have regard to a relevant financial model even if it was complex'[661]

---

654 SFG Consulting, The Fama-French model Report for Jemena Gas Networks; ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, May 2014, pp27-32.

655 SFG Consulting, The Fama-French model Report for Jemena Gas Networks; ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, May 2014, pp26-27.

656 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, p1-14.

657 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, p12.

658 Brailsford, T., Guant, C., and O'Brien, M., The investment value of the value premium, Pacific-Basin Finance Journal, 20, 2012, P417.

659 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, 13 May 2014, p24.

660 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, p18.

661 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, 13 May 2014, p23. They also argue that just because the FF model has more variables than the Sharpe-Lintner CAPM, this does not mean it is less accurate. E.g. if aircraft flight times are affected by a number of variables, a model is not less accurate if it includes all the variables (pp23-24).

- while the FFM produces a less precise estimate than the SLCAPM 'because it requires beta estimates relative to, not one, but three factors', nevertheless it is less biased[662]
- there may be a trade-off between precision (low standard deviation) and bias[663]
- given its relative lack of bias, the FFM should be considered.[664]

In response to these submissions on the relative complexity of the FFM, we note 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 relative to the SLCAPM given the high degree of uncertainty around its estimate. We also do not consider the FFM model will provide a more unbiased estimate relative to the foundation model approach using the SLCAPM as the foundation model given we consider there is no compelling evidence our approach as applied will give a downward biased estimate of the ROE.

McKenzie and Partington, having fully reviewed the NSPs' proposals, have indicated they do not consider the FFM should be used for estimating the return on equity due to uncertainties that surround the use of the model.[665] They consider the evidence indicates the model is not likely to produce estimate that are empirically stable and the model does not have the ability to reliably estimate the required RoE for a benchmark efficient entity.[666] They also highlight a vast array of models proposed which add further factors to the FFM and point to one academic article that shows over 50 variables have been used to predict stock returns and another that shows over 330 different predictive return signals.[667] They also point out even Fama and French themselves have proposed a five factor version of the model that they claim provides a better description of returns than their original three factor model.[668]

In response to our commentary in explaining the Guideline position that there is little evidence of the use of the FFM model by companies or regulators to estimate the cost of capital, SFG Consulting have submitted:[669]

- the background paper for the Nobel prize awarded to Eugene Fama for his finance work states that the FFM factors are now 'standard'
- the CFA certification 'includes extensive coverage of the Fama-French model'
- leading journals on financial economics continue to publish articles on the Fama-French model
- survey evidence may be misleading
- there are two examples of the FFM being used in US courts

662 NERA Consulting, The Fama-French Three-Factor Model A Report for the Energy Network Association, October, 2013, p24.
663 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, pp99-100.
664 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, pp102-103.
665 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, p18.
666 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, p18.
667 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,pp16-17.
668 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, p16.
669 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA Power Networks, 13 May 2014, pp17-32.

- betas for the FFM are provided by Morningstar.

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 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 CAPM. However, we consider there is a clear difference between a theoretical factor model that econometrically fits realised return data and an asset pricing model that stably predicts future expected returns and is used to systematically and stably price assets. Our views on the models inability to stably predict returns is supported by McKenzie and Partington who note they consider the parameter instability of the model demonstrated in the literature symptomatic of the weakness of the model.[670]

We remain of the view the position in the Guideline that the FFM is not commonly used by companies to estimate their cost of capital, or used by regulators to estimate the allowed rate of return is well supported. There is evidence that regulators, in particular, tend not to use the FFM. A recent study by Stephan Schaeffler and Christoph Weber examines the regulatory practices in 21 countries, and concludes 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.[671] In addition, as part of reviewing the material submitted by NSPs in support of their claims, we examined 32 valuation (expert) reports completed in 2013 and 2014.[672] As discussed above, 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, and 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 mechanistic way, to value firms in Australia. We also do not consider this level of use justifies our 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, but it also may 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.[673] Subsequent research into factor modelling, however, has identified a variety of factors in addition to those in the FFM model—including 'momentum', as well as a number of macroeconomic variables.[674] 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, about the appropriate factors to use in factor modelling. Given the large range of potential factors used in factor

---

670 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, p18.

671 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.

672 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.

673 For example, see: Fama, E. F, and French, K. R., Multifactor Explanations of Asset Pricing Anomalies, The Journal of Finance, Volume 51, Issue 1 (March 1996), pp55-88.

674 Cochrane, John (2011), Presidential address: discount rates, Journal of Finance, Volume 66, Issue 4 (August 2011), pp1047-1108.

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 come up with a suitably reliable estimate of the RoE for regulatory use.

The publication of FFM beta estimates by Morningstar, the teaching of the FFM in the CFA, and the contents of the background paper for the Nobel prize do not change our view on the use of the model. Morningstar, as with other data services, publishes a range of information for various reasons and 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, and covering the application of the FFM does not indicate that the model is widely used. Finally, the background 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 is for the Nobel Laureates' empirical contribution to the understanding of how asset prices are determined and not for developing an asset model that is generally accepted as correct.[675] The paper states: [676]

> [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].

While the paper indicates Morningstar does publish Alpha relative to the FFM factors and states it has become standard to evaluate performance relative to 'size' and 'value' benchmarks, the paper provides no compelling evidence that the FFM is widely used to price individual assets, or is suitable for setting regulatory rates of return (even if it was commonly used to price assets).[677]

McKenzie and Partington agree with the AER that the FFM cannot be used for reliably estimating the RoE at this time due to the uncertainties surrounding the model.[678] However they do note that the model might be used (either alone or in combination with other models) to estimate the RoE if the model was used appropriately and a number of the issues with the model were resolved.[679] They also make 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'.[680]

We consider the point McKenzie and Partington make that the model is used to estimate average returns in the cross section calls into question the appropriateness of the application of the FFM to the benchmark firm (even if you did accept the factors were priced in the cross section, which is still unresolved). While SFG has referred to a number of possible explanations the value factor could be genuinely priced in average returns in the cross section,[681] none of the possible reasons is commonly

---

675 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, p1.

676 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, p1.

677 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, p273.

678 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, pp18-19.

679 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, p19.

680 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, p18.

681 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, 13 May 2014, pp30-32.

accepted, and they don't necessarily imply that our benchmark entity would need further compensation (above the level provided for under the SLCAPM).

In response to our position that the model is relatively complex and opaque and estimates from the model are sensitive to the choice of estimation periods and methodological assumptions, the NSPs have submitted:

- The variation between FFM estimates arises because the studies that produce them are of different quality. The AER should only consider estimates from the best studies.[682]
- '[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.'[683]

As noted above, we do not consider there are clear objective grounds to distinguish the 'best' studies. McKenzie and Partington support this view.[684]

In response to our commentary in explaining the Guideline position on the lack of theoretical foundation for the FFM, the NSPs have submitted:

- The FFM can be embedded in a theoretical framework—either Merton's ICAPM model or Ross's arbitrage pricing theory model.[685]
- The book-to-market ratio can be interpreted as a proxy for either (i) a financial distress risk factor (ii) a GDP growth risk factor (iii) the exposure to market risks.[686]
- While SFG concedes that the size factor is not persistent in the data, it emphasises that the value factor is persistent, and, moreover, that the persistence of the value factor provides a good reason to think the value factor has a theoretical foundation.[687] On the other hand, NERA maintains that both factors may be persistent, although noting the size premium is not statistically significant.[688]
- It is legitimate to use a model which is supported by robust empirical evidence 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.[689]

In response to the NSPs' submissions, we do not agree that the Guideline simply dismissed FFM on the grounds that the theoretical arguments appeared after the empirical arguments. Rather, our concern arises because both (i) the parameters have proven to be somewhat unstable and (ii) the ex

---

682 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, 13 May 2014, p24; 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.

683 NERA, The Fama-French Three-Factor Model A report for the Energy Networks Association, October 2013, p31.

684 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, p18.

685 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, 13 May 2014, p2.

686 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.

687 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, 13 May 2014, p11-15.

688 NERA, The market, size and value premiums A report for the Energy Networks Association, June 2013, p91.

689 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA PowerNetworks, 13 May 2014, pp28-29.

post theoretical explanations of the risk factors remain contested.[690] That the FFM might be embedded in a theoretical framework does not change the fact the model was empirically motivated. Despite NERA's defence of the size effect, it appears to have disappeared in Australia,[691] which is conceded by SFG.[692] Moreover, estimates of the value factor also changes in magnitude over time.[693] In addition, while the FFM could be genuinely pricing risk (in the cross section at least), there is no consensus it is, or if it is what priced risk the non-market factors are actually capturing.

McKenzie and Partington also point to academic literature that supports our proposition that the theoretical basis of a model is an important consideration in determining the value to attribute to empirically based estimates. This literature indicates a higher degree of empirical certainty may be warranted where there is less of a theoretical basis for the result.[694]

In response to our commentary in explaining the Guideline position that is it is unclear the FFM is estimating ex-ante priced risk factors, SFG for the NSPs submit that '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'.[695]

In response to the submission by SFG for the NSPs on this point, we stress the fact the FFM is not clearly ex ante pricing risk factors is only one piece of information we have had regard to in exercising our regulatory judgment when determining to not use the model. We have considered this in combination with the clear 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. However, we accept that if there was one well accepted application of the model that was consistently being used to price individual assets with characteristics similar to our benchmark firm (that is, not average) we would be more likely to conclude the model is pricing ex-ante risk factors relevant to the regulated rate of return.

Overall, in response to the NSPs' submissions on the FFM, we consider the material before us does not justify the use of the FFM in our regulatory context. As explained in reasons for the draft decision section and above, there are numerous different specifications of the model that will come up with different estimates of the RoE, and there is no single correct application. In addition, it is unclear that any of the different RoE 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 our benchmark entity even if they were capable of estimating required returns for the average firm. Given these significant limitations, and for the further reasons stated above, in the reasons for our draft decision section and in the appendices to the Explanatory Statement to the Guideline[696], we do not consider the empirical estimates of the RoE from the FFM appropriate for setting or assessing regulatory returns on equity capital. We also do not consider the NSPs RoE estimates from the model provide any compelling evidence that our SLCAPM estimate of the required RoE is downward biased, or that our RoE will not lead to a rate of return that meets the RoR objective.

---

690 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.

691 NERA, The market, size and value premiums A report fothe Energy Networks Association, June 2013, p91

692 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA Power Networks, 13 May 2014, p15.

693 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA Power Networks, 13 May 2014, p36.

694 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, p17.

695 SFG Consulting, The Fama-French model Report for Jemena Gas Networks, ActewAGL, TasNetworks, TransGrid, and SA Power Networks, 13 May 2014, p26.

696 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp18-23.

We have come to the conclusion that the use of the model will not lead to a RoR that meets the RoR objective. We do not consider its use will be in the long term interests of consumers.

Our assessment against our assessment criteria is set out in the reasons for draft decision section.

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 RoE on our benchmark efficient entity
- performing a cross check on whether other models (including the SLCAPM) are coming up with reasonable estimates of the RoE that will lead to an allowed RoR that will meet the RoR 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 note we consider this is unlikely in the near term given the discussions above and the issues still facing the model over 20 years since the model was developed.

A.2.3 The Black CAPM

Fischer Black developed a version of the CAPM with restricted borrowing.[697] This model has become known as the Black CAPM. 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 has 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 CAPM assumption of unlimited borrowing and lending at the risk free rate, in its place he assumes investors can engage in unlimited short selling, something equally unrealistic.[698]

In the place of the risk free asset in the CAPM, Black substitutes the minimum variance zero-beta portfolio. This zero beta portfolio faces no market (systematic) risk and is formed through the utilisation of short selling. Black shows in his model that the return on every asset is linear function of its Beta (as in the SLCAPM) and that in the CAPM (security market line) equation the expected return on the zero beta portfolio replaces the risk free asset.[699]

Relative to the CAPM that can utilise observable proxies for the risk free rate, the Black CAPM now has a further key parameter to estimate, the zero beta expected return.

At the time we published the Guideline, based on the information before us, we determined in relation to the Black CAPM:

- the theory behind the model would be used to inform the beta estimates to be used in the SLCAPM

---

697 Black, F., Capital Market Equilibrium with restricted borrowing, The Journal of Business, 45(3), 1972, pp444-455; M&P p20.

698 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,p22

699 Black, F., Capital Market Equilibrium with restricted borrowing, The Journal of Business, 45(3), 1972, pp444-455; M&P pp446-450.

- the model would not be used to empirically estimate the return on equity for a benchmark regulated service provider.

Having fully reviewed the NSPs' proposals and supporting documents, we remain of the view that RoE estimates from the Black CAPM should not be used for determining the regulatory RoE at this time for the reasons set out in the Explanatory Statement to the Guideline, the Appendices to the Explanatory Statement, and in this decision. We do not consider the use of RoE estimates from the Black CAPM will result in a RoE that leads to an allowed RoR that meets the RoR objective.

We remain of the view the key reasons for us limiting the role of the Black CAPM in the Guideline to using the theory behind it to informing the beta estimate remain valid:[700]

- The empirical implementation of the Black CAPM model is unreliable because a) in contrast to the risk-free rate, the return on the zero beta asset is unobservable, and b) methods for estimating the zero-beta asset are unreliable.
- NERA's 2012 submission to the AER presents estimates of a Black CAPM model implying a negative market risk premium which illustrates the unreliability of the model.
- There is little evidence that the Black CAPM is used by other regulators, academics or market practitioners to estimate the return on equity. Regulators, in particular, rarely have recourse to the Black CAPM.
- Potential issues that arise from failing to estimate the Black CAPM can be accommodated by using a conservative estimate of beta in the SLCAPM.

We consider the sensitivity of the Black CAPM to implementation choices, combined with its lack of use, largely makes it unsuitable to use to estimate the RoE for our benchmark efficient entity.

We have found no evidence of use of the Black CAPM by Australian market practitioners[701]and a recent study by Stephan Schaeffler and Christoph Weber, which examines regulatory practices in 21 countries, concludes that the 'standard model for determining capital costs' for energy businesses is the SLCAPM.[702] Moreover, it does 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 CAPM[703], it now appears NERA accepts the Black CAPM is not a well-accepted model adopted by market practitioners.[704]

The instability of the Black CAPM is highlighted in NERA's recent report for TransGrid which lists the following prior estimates of the zero beta return for the Australian market:[705]

- CEG (2008) reports zero beta premium estimates between 7.21%p.a. and 10.31%p.a.
- NERA (2013) reports zero beta premium estimates between 8.74%p.a. and 13.95%p.a.

---

700 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp8, 68-73.

701 As part of reviewing the material submitted by NSPs 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.

702 Schaeffler, S., and Weber, C., The cost of equity of network operators - empirical evidence and regulatory practice, Competition and Regulation in network industries, Volume 14(2), 2013, p386.

703 NERA, The Fama-French Three-Factor Model A report for the Energy Networks Association, October 2013, p41.

704 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014TransGrid, p92.

705 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014TransGrid, p91

NERA also acknowledge that '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'.[706] They also acknowledge the implausibility of the zero beta premium being equal to the MRP. However, NERA claim the result simply reflects that there is no relationship between systematic risk and return.[707]

SFG in their report for the NSW DNSPs acknowledge you might expect the zero beta return to lie below the expected return on the market.[708] SFG estimate a somewhat more plausible estimate of the zero beta premium of 3.34%p.a.[709] They then attempt to reconcile their estimate with NERA's and state:[710]

> The reason our point estimate of the zero beta premium is lower than the AER's market risk premium estimate of 6.5%, and NERA's (2013) estimates are higher than the AER's market risk premium estimate is as follows. 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.

While we consider SFG's latest estimate of the zero beta premium appears more plausible, we remain of the view that the large range of zero beta estimates by consultants for the NSPs indicates the model is unsuitable to use to estimate the RoE of our benchmark efficient entity.

Our consultants, McKenzie and Partington, fully reviewed the NSPs' proposals and supporting documents in relation to the Black CAPM.[711] As discussed in the reasons for the draft decision section, they indicate with respect to the Black CAPM:

- the model is not based on more realistic assumptions than the CAPM and the Black CAPM cannot be directly compared to the SLCAPM as they each involve very different investment strategies[712]
- while the model might be used for estimating the RoE on the benchmark efficient entity, the problem is the model can be very sensitive to implementation choices[713]
- they would not recommend using the NSPs estimates from the Black CAPM to inform the equity beta given the practical difficulties with implementing the model[714]
- the model (of itself) does not justify any uplift to the equity beta.[715]

---

706 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014TransGrid, p91.
707 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014TransGrid, p92.
708 SFG, Cost of Equity in the Black Capital Asset Pricing Model Report for Jemena Gas Networks, ActewAGL, Networks NSW, TasNetworks, Ergon and SA Power Networks, 22 May 2014, p3
709 SFG, Cost of Equity in the Black Capital Asset Pricing Model Report for Jemena Gas Networks, ActewAGL, Networks NSW, TasNetworks, Ergon and SA Power Networks, 22 May 2014, p3
710 SFG, Cost of Equity in the Black Capital Asset Pricing Model Report for Jemena Gas Networks, ActewAGL, Networks NSW, TasNetworks, Ergon and SA Power Networks, 22 May 2014, pp3-4.
711 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, pp20-25.
712 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, pp22-23.
713 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, p25.
714 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, p24.

Handley also considers the Black CAPM in his report.[716] We consider his report also supports our decision to not use empirical estimates from the model. He notes with respect to the model:

- it is not widely used in practice because the estimation of the zero beta rate, which can fall anywhere below the expected return on the market, is a non-trivial task[717]
- the Black CAPM and low beta bias are not equivalent concepts and as such, the empirical results of Black Scholes and Jenson (1972) and Fama and French (2004) are not direct tests of the Black CAPM[718]
- It is unclear low beta bias is a priced risk not already captured by the SLCAPM[719]
- NERA's results that the zero beta premium equals the MRP has un 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.'[720] [721]

While we agree with McKenzie and Partington that the Black CAPM (of itself) does not justify an uplift to the equity beta to be used in the SLCAPM,[722] 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 and that this is a relevant consideration in selecting the equity beta.

Despite many of the issues facing the Black CAPM being covered during the Guideline development process, most NSPs have submitted that empirical estimates from the Black CAPM should be used for estimating the return on equity capital.[723] The NSPs then use their empirical estimates of the RoE from the Black CAPM to do one or more of the following:

- to estimate their proposed RoE (as part of a multi model approach)[724]
- to provide evidentiary support that their estimate of the RoE is reasonable and will lead to a RoR that meets the RoR objective[725]

---

715 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, p24.

716 John C. Handley, *Advice on return on equity,* 16 October 2014, pp9-12.

717 John C. Handley, *Advice on return on equity,* 16 October 2014, p12.

718 John C. Handley, *Advice on return on equity,* 16 October 2014, p10.

719 John C. Handley, *Advice on return on equity,* 16 October 2014, p11.

720 John C. Handley, *Advice on return on equity,* 16 October 2014, p12;

721 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.

722 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,p24.

723 Ausgrid, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, p79; Endeavour Energy; Regulatory Proposal 1 July 2015 to 30 June 2019, 30 May 2014, p119; Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, p104; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p12; ; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p261; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p1. TransGrid

724 TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp12-13; ActewAGL, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, p274; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.

725 Ausgrid, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp79-80; Endeavour Energy; Regulatory Proposal 1 July 2015 to 30 June 2019, 30 May 2014, pp119-120; Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp104-106; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp188-190; ; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, pp273-276; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.

- to provide evidence that the foundation model approach as set out in the Guideline will not lead to a RoR that meets the RoR objective.[726]

In support of the use of empirical estimates of the RoE from the Black CAPM, the NSPs appear to have responded to a number of key reasons for limiting the role of the Black CAPM in the Guideline to informing the equity beta.[727]

As discussed above, SFG have provided what appears to be a more plausible estimate of the zero beta premium. SFG have indicated the appropriate and transparent approach to considering the Black CAPM is rather than taking a conservative estimate of beta, you should empirically estimate it.[728] SFG have also sought to reconcile the different estimates between consultants and indicated they are not statistically different.[729] We consider none of these submissions overcome the key issues with the model for the reasons discussed above.

In response to our commentary in explaining the Guideline position that the estimates from the Black CAPM are unreliable because (a) in contrast to the risk-free rate, zero beta returns are not observable (b) there is no reliable method to obtain an estimate of this return, NERA have submitted the following responses to the sources of unreliability identified in McKenzie and Partington (2012):[730]

- The results of CEG and Lajbcygier and Wheatley do not imply returns across shares and through time are constant. Rather, they solely indicate that an estimate of the beta of a stock is not useful in explaining the cross-section of mean returns.[731]

- The example McKenzie and Partington (2012) give to show the estimates of the zero beta return can be sensitive to the choice of an efficient proxy for the market portfolio is of no practical relevance because the market portfolio plots far from the area in the mean-variance space where the issue demonstrated by McKenzie and Partington would be an issue.[732]

- The issue raised around the non-uniqueness of the zero beta rate attached to an inefficient portfolio is of little concern as regression can still be used to estimate the equity beta and while it will not produce a unique set of estimates, it will produce a limited range.[733]

- Thin trading will not be an issue if you used monthly data and either value weighted portfolios or large firms. It is not an issue for NERA's results as they used value weighted portfolios of stocks and monthly data.[734]

- Published simulation evidence indicates that standard errors attached to estimates of the zero-beta premium are not unreliable.[735]

---

726 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp83-84; *Endeavour Energy; Regulatory Proposal* 1 July 2015 to 30 June 2019, 30 May 2014, pp.125–126, *Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp. 111–12, ; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p191; ; ActewAGL, *Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014*, pp262; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.

727 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp8, 68-73.

728 SFG, *Cost of Equity in the Black Capital Asset Pricing Model Report for Jemena Gas Networks, ActewAGL, Networks NSW, TasNetworks, Ergon and SA Power Networks*, 22 May 2014, p19.

729 SFG, Cost of Equity in the Black Capital Asset Pricing Model Report for Jemena Gas Networks, ActewAGL, Networks NSW, TasNetworks, Ergon and SA Power Networks, 22 May 2014, p3.

730 NERA, *Estimates of the Zero-Beta Premium A report for the Energy Networks Association*, June 2013.

731 NERA, *Estimates of the Zero-Beta Premium A report for the Energy Networks Association*, June 2013, p25.

732 NERA, *Estimates of the Zero-Beta Premium A report for the Energy Networks Association*, June 2013, pp26-30.

733 NERA, *Estimates of the Zero-Beta Premium A report for the Energy Networks Association*, June 2013, p33.

734 NERA, *Estimates of the Zero-Beta Premium A report for the Energy Networks Association*, June 2013, p34.

735 NERA, *Estimates of the Zero-Beta Premium A report for the Energy Networks Association*, June 2013, pp34-37.

In response to these comments by NERA, we consider nothing has changed our view on the empirical use of the model, or overcomes 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 beta, where you do not consider there is a relationship between beta and required return.

McKenzie and Partington also consider NERA's submissions and remain of the view the model is empirically unstable and state: [736]

> 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

Our assessment against our assessment criteria is set out in the reasons for draft decision section.

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 including:

- estimating the RoE on our benchmark efficient entity
- performing a cross check on whether other models (including the SLCAPM) are coming up with reasonable estimates of the RoE that will lead to a RoR that will meet the RoR objective.

We consider the theory behind the Black CAPM demonstrates that an uplift to the raw equity beta estimate may be appropriate due to 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).

A.2.4 Dividend Growth Model

At the time we published the Guideline we determined we would limit the use of DGMs (based on market wide dividend estimates) to informing the market risk premium to be used in the SLCAPM.[737] We also indicated we would not use a DGM to estimate the required return on equity on individual network businesses.[738]

At the time we published the Guideline the key reasons for limiting the use of the DGM to estimating the market risk premium included:

- We considered a sufficiently robust data series existed for estimates of dividend yields for the Australian Market.[739]
- Methods for estimating the growth rate of dividends for the Australian market have been developed.[740]
- We did not consider a sufficiently robust data existed to form robust estimates of the required return on equity for Australian energy service providers.[741] We noted there were difficulties with

---

736 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, p24.

737 AER, *Rate of return guideline*, 17 December 2013, p13.

738 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp14-17.

739 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p15.

740 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p15.

741 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p15.

constructing credible datasets for implementing industry specific DGMs[742] and there were not enough Australian businesses to perform DGMs on individual businesses.[743]

- It was unclear if a sufficiently robust method for estimating the growth rate of dividends for Australian energy service providers has been developed. We noted this was particularly the case for the long term growth rate assumption.[744]

We also noted the sensitivity of DGMs to input assumption limits the ability to use DGMs as the foundation model. For example, estimates of simple DGMs (such as those previously proposed by CEG) currently provide estimate of the return on equity for the benchmark efficient entity that are implausible. That is, they estimate the required RoE for the benchmark efficient entity that exceed the return on the market determined by the same model. We also noted that DGMs generated average returns on equity for energy infrastructure businesses over an extended period significantly in excess of the average return on equity for the market and this failed the sanity test as the systematic risk of network businesses is less than the overall market.[745]

Our consultants, McKenzie and Partington, having fully reviewed the NSPs' proposals and supporting documents, support our decision to not use the model empirically to directly estimate the RoE on our benchmark efficient entity.[746] They also support limiting the use of the DGM to informing the estimate of the market risk premium.[747] They raise specific concerns about the simultaneous estimation approach applied by SFG for the NSPs and indicate under the approach virtually any RoE estimate may be generated through model specification choices.[748]

While we remain of the view we will use the DGM to inform the estimate of the market risk premium, we agree with the concerns from McKenzie and Partington around the reliability of estimates from the model[749] and have taken these concerns into account in our decision.

The majority of NSPs have submitted that empirical estimates from the DGM should be used for estimating the RoE[750], or effectively used for estimating the RoE through using industry DGM RoE risk premium estimates relative to market DGM RoE risk premium estimates to inform the SLCAPM equity beta.[751] The NSPs then use their empirical estimates of the RoE to do one or more of the following:

- to estimate their proposed RoE (as part of a multi model approach, or to inform input parameters into the SLCAPM)[752]

742 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 77.
743 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 119.
744 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p15.
745 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 120-122.
746 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, pp39-40.
747 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, p39.
748 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, pp34-36.
749 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, pp26-36.
750 TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p12; ; ActewAGL, *Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period*, 2 June 2014, p261; Jemena Gas Networks, *2015-20 access arrangement information*, *appendix 9.03 Return on equity proposal*, 5 June 2014, p1.TransGrid
751 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, p11.
752 TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp12-13; ; ActewAGL, *Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period*, 2 June 2014, p274; Jemena Gas Networks, *2015-20 access arrangement information*, *appendix 9.03 Return on equity proposal*, 5 June 2014, p2.

- to provide evidentiary support that their estimate of the RoE is reasonable and will lead to a RoR that meets the RoR objective[753]
- to provide evidence the foundation model approach as set out in the Guideline will not lead to a RoR that meets the RoR objective.[754]

The NSPs have made a number of submissions with respect to the use of the DGM in response to our proposal in the Guideline to limit the role of the DGM to informing the MRP and in relation to how we proposed to apply it to do this. The key points are covered below.

In response to our commentary explaining the Guideline position that the DGM should not be used to estimate the return on equity for Australian energy service providers, a number of NSPs consider that the beta parameter should reflect the return on equity from an industry level DGM.[755] They also consider that the DGM should be used to inform the overall return on equity and not be limited to informing the market risk premium.[756] The majority of NSPs have used an estimate by SFG of an industry wide return that is then used to estimate the beta and MRP to be used in the SLCAPM.[757]

In response to the submissions on this point we remain of the view that DGM estimates at the firm level are too unreliable to use to estimate the RoE. Nothing submitted since the Guideline has changed our view. We consider our consultants' reports support this view.[758]

In addition to the points above, we also note:

- Applying SFG's DGM methodology to come up with a beta estimate to use in the SLCAPM appears to simply utilise the SLCAPM to generate a DGM based RoE estimate.
- There are only 99 analysts' forecast based estimates of the RoE for network business between 1 June 2002 and 20 February 2014 versus 5344 analysts' forecast based estimates of the RoE for all firms in the market.[759] This illustrates why DGM estimates would be expected to be more reliable at the market wide level than the industry specific level (noting we now don't consider them particularly reliable at the market level).

---

753 Ausgrid, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, p85; Endeavour Energy; *Regulatory Proposal 1 July 2015 to 30 June 2019*, 30 May 2014, pp128-129; Essential Energy, *Regulatory Proposal 1 July 2014 to 30 June 2019*, 30 May 2014, pp114-115; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, pp188-190; ActewAGL Distribution, *Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014*, pp273-276; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.

754 Ausgrid, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp85; Endeavour Energy; Regulatory Proposal 1 July 2015 to 30 June 2019, 30 May 2014, pp128-129; Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp114-115; TransGrid, *Revenue proposal 2014/15 to 2018/19*, May 2014, p191; ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, pp262; Jemena Gas Networks, *2015-20 access arrangement information*, appendix 9.03 Return on equity proposal, 5 June 2014, p2.

755 ActewAGL Distribution, Regulatory Proposal 2015-19 Subsequent regulatory control period, 2 June 2014, pp. 258, 263; SFG, The required return on equity for regulated gas and electricity network businesses, 27 May 2014, p. 88, 95 CEG, *WACC estimates: A report for NSW DNSPs*, May 2014, p. 19, 56-57.

756 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, pp119,128-129 ; Essential Energy, Regulatory Proposal 1 July 2014 to 30 June 2019, 30 May 2014, pp104,114-115; 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, p. 56-59.

757 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; CEG, *WACC estimates: A report for NSW DNSPs*, May 2014, pp7, 19-20.

758 John C. Handley, *Advice on return on equity,* 16 October 2014, pp13-15; 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, pp26-41.

759 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, pp49-50.

- The very high RoE estimates from SFG's DGM model, equating to an 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, and the results in Professor Olan Henry's 2014 report.

Further discussion on the use of the DGM for estimating the RoE and around the application of the DGM to estimate the MRP is contained in the reasons for draft decision section and the DGM Appendix.

Our assessment against our assessment criteria is summarised in the reasons for draft decision section.

Overall conclusions with respect to the DGM

For the reasons discussed above, we do not consider empirical estimates from DGMs are suitable for our regulatory task including:

- estimating the RoE on our benchmark efficient entity
- estimating a RoE to use to assess the reasonableness of other RoE estimates against (including the RoE estimate from our implementation of the SLCAPM).

We remain of the view it is appropriate to use the AER's DGM specifications to inform the MRP for the reasons discussed in the reasons for draft decision section and the DGM appendix. However, as discussed therein, we note McKenzie and Partington's concerns around our DGM models' outputs, and have taken this into account when considering the use of the MRP estimates from our models.

A.2.5 Other model based estimates of the RoE proposed by NSPs

A number of other estimates for RoE have been put forward by NSPS in support of their proposals.[760] While these are also discussed in the reasons for draft decision section, the specific applications of these models by CEG and NERA are considered below.

While we have had regard to and considered the empirical estimates provided based on these alternative specifications of the SLCAPM, we have not used any of these estimates in estimating the RoE. As with the empirical estimates of the RoE from the FFM, Black CAPM and DGM, we do not consider using empirical estimates of the RoE from any of the 'long term' (historically based) or Wright (that assumes the real expected return on the market is constant) specifications of the SLCAPM will result in an allowed RoR that meets the RoR objective.

We note that while we have considered these specifications of the SLCAPM as distinct from the standard forward looking SLCAPM specification, we would come to the same conclusion (to not use the methods) if we considered the models discussed here as simply methods for estimating inputs to the SLCAPM (as opposed to distinct models).

NERA's 'prevailing' specification of the SLCAPM is substantively the same as the AER's with the exception of using different input parameters. Therefore it is not considered here.

---

760 We note that NERA does not submit that any of its estimates from the different SLCPAM specifications reflect the benchmark entity's required RoE.

NERA Long-term average specification of the SLCAPM

NERA for TransGrid estimated a 'long-term average' specification of the SLCAPM which gives an estimated RoE of 8.9 per cent.[761] It uses historically based estimates of both the risk free rate and market risk premium combined with its equity beta estimates of 0.58.[762] The specification for each input parameter was calculated as follows:

- the risk free rate was based on the average YTM on 10 year Commonwealth Government Bonds over the last 10 years to 31 March 2014 (5.11 per cent)
- the MRP was calculated as the average excess return on the market portfolio of 6.5 per cent
- the equity beta of 0.58 was based on an estimate by SFG Consulting using a group of nine Australian firms.

We consider NERA's Long term average specification does not and would not be expected to result in a RoE that will lead to an allowed RoR that meets the RoR objective. We do not agree with the form of the model (a historically based SLCAPM). The SLCAPM is a forward looking asset pricing model. While 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, 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 RoE.

With respect to each input parameter NERA used we note the following:

- The risk free rate estimate of 5.11% is far above the current forward looking risk free rate estimated using the YTM on 10 year Commonwealth Government Bonds. 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. The use of a historically based risk free rate is discussed further in the reasons for draft decision section.
- We consider the MRP of 6.5% is a reasonable estimate of the forward looking MRP for the reasons discussed in the reasons for draft decision section and the MRP appendix.
- We consider a beta estimate of 0.7 is more appropriate for the reasons discussed in the reasons for draft decision section and the Beta appendix.

Our assessment against our assessment criteria is set out in the reasons for draft decision section.

CEG Long-term average specification of the SLCAPM

CEG for the NSW DNSPs also estimated a long term specification of the SLCAPM which gives an estimated RoE of 10.1 per cent.[763] As with NERA's specification, it uses historically based estimates of both the risk free rate and market risk premium combined with its equity beta estimate. However, its historically based estimates for the risk free rate are estimated over the period from 1883 to 2011. The specification for each input parameter was calculated as follows:

- the risk free rate was based on the average YTM on 10 year Commonwealth Government Bonds over the period 1883-2011 (4.8 per cent)

---

761 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014,p.45.

762 NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p80.

763 CEG, *WACC estimates: A report for NSW DNSPs*, May 2014.

- the MRP was calculated as the average excess return on the market portfolio over the period 1883-2011o (6.5 per cent)

- its equity beta estimate of 0.82 was based 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 and consider CEG's Long term average specification does not and would not be expected to result in a RoE that will lead to an allowed RoR that meets the RoR objective.

With respect to each input parameter used we note the following:

- the risk free rate estimate of 4.8 per cent is far above the current forward looking risk free rate estimated using the YTM on 10 year Commonwealth Government Bonds. 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. The use of a historically based risk free rate is discussed further in the reasons for draft decision section.

- we consider the MRP of 6.5 per cent is a reasonable estimate of the forward looking MRP for the reasons discussed in the reasons for draft decision section and the MRP appendix.

- we consider an equity beta estimate of 0.7 is more appropriate for the reasons discussed in the reasons for draft decision section and the Equity Beta appendix.

Our assessment against our assessment criteria is set out in the reasons for draft decision section.

NERA's Wright Specification of the SLCAPM

NERA for TransGrid estimated a 'Wright' specification of the SLCAPM that results in an estimated RoE of 8.47 per cent.[764] It uses the prevailing risk-free rate (4.14 per cent) and equity beta. However the Wright specification assumes the return on the market is relatively constant through time and therefore there is a strong inverse relationship between movements in the risk free rate and movement in the MRP. The specification for each input parameter was calculated as follows:

- the risk free rate was estimated as 4.14 per cent based on the 20 business days to 31 March 2014[765]

- the equity beta of 0.58 was based on an estimate by SFG Consulting using a group of nine Australian firms

- the MRP was calculated 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 giving a nominal return on the market of 11.6 per cent and an MRP of 7.46 per cent (11.6%–4.14% = 7.46%).

We consider NERA's Wright specification (as applied at the time applied) could result in a RoE estimate that will lead to an allowed RoR that meets the RoR objective.[766] However, we consider the model would not be expected to result in a RoE estimate that leads to an allowed RoR that meets the RoR objective because we don't consider the model is theoretically or empirically robust.

---

[764] NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014TransGrid, p81.

[765] We note this would be updated in any actual application.

[766] The reasons this could lead to a reasonable estimate is while we consider the MRP is too high, this is largely offset by the lower beta of 0.58 (relative to our point estimate chosen of 0.7).

We note the following consideration with respect to NERA's application of the model:

- We do not agree with the form of the model, or the underlying premise of the model that there is a strong inverse relationship between movements in the risk free rate and MRP and note the model is not widely accepted or used in practice. 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 strong inverse relationship between the long term forward looking risk free rate and the long term forward looking MRP.

- We do not consider the model adequately takes into account the prevailing conditions in the market for equity funds given the degree to which it results in movements in the MRP offsetting movements in the risk free rate.

- We agree with the proxy used to measure the risk free rate (an average of relatively current YTMs on 10 year maturity Commonwealth Bonds).

- We consider the MRP estimate of 7.46 per cent is too high for the reasons discussed in the reasons for draft decision section and the MRP appendix.

- We consider the use of an equity beta of 0.7 more is more appropriate for the reasons discussed in the reasons for draft decision section and the Equity Beta appendix.

NERA's use of an MRP of 7.46 per cent and a beta of 0.58 results in an equity risk premium of 4.33 per cent, which is only marginally lower than the AER's estimate of 4.55 per cent (calculated as 0.7*6.5 per cent) and we consider 4.55 per cent does result in a RoE that will lead to an allowed RoR that meets the RoR objective. For these reasons we consider the models RoE estimate is close enough to our RoE estimate that this specific RoE could lead to an allowed RoR that meets the RoR objective.

CEG's Wright Specification of the SLCAPM

CEG for the NSW DNSPs also estimated a 'Wright' specification of the SLCAPM. CEG's estimate results in an estimated RoE of 10.2 per cent.[767] It uses the prevailing risk-free rate (3.96 per cent) and CEG's estimate of the equity beta of 0.82. Each input parameter was calculated as follows:

- the risk free rate was estimated as 3.96 per cent based on the YTM on 10 year to maturity CGS averaged over 20 days ending 13 May 2014[768]

- its equity beta estimate of 0.82 was based on regression based beta estimates using both Australian and US firms

- the MRP was calculated as 7.60 per cent. This was based on an estimated real return on the market of 8.84 per cent and an inflation rate of 2.5 per cent giving a nominal return on the market of 11.56 per cent and an MRP of 7.60 per cent (11.56%–3.96% = 7.60%).

[767] CEG, WACC estimates A report for NSW DNSPs, May 2014, p30.

[768] CEG, WACC estimates A report for NSW DNSPs, May 2014, pp21,26 ; We note this would be updated in any actual application.

We do not consider CEG's Wright specification does or would be expected to result in a RoE that will lead to an allowed RoR that meets the RoR objective, or that the model is theoretically or empirically robust for the reasons discussed with respect to NERA's Wright SLCAPM specification.

We note the following consideration with respect to CEG's application of the model:

- we do not agree with the form of the model, or the underlying premise of the model that there is a strong inverse relationship between movements in the risk free rate and MRP
- we do not consider the model adequately takes into account the prevailing conditions in the market for equity funds given the degree to which it results in movements in the MRP offsetting movements in the risk free rate;
- we agree with the proxy used to measure the risk free rate (an average of relatively current YTMs on 10 year maturity Commonwealth Bonds)
- we consider the MRP estimate of 7.6% is too high for the reasons discussed in the reasons for draft decision section and the MRP appendix
- we consider CEG's estimate of an equity beta of 0.82 is too high for the reasons discussed in the reasons for draft decision section and the Equity Beta appendix.

For these reasons we consider CEG's Wright model specification RoE estimate will not lead to an allowed RoR that meets the RoR objective.

Our assessment against our assessment criteria is set out in the reasons for draft decision section.

Overall conclusions with respect to 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 (i.e. historically based versions of the SLCAPM) are currently suitable for our regulatory task including:

- estimating the RoE on our benchmark efficient entity
- estimating a RoE to use to assess the reasonableness of other RoE estimates against (including the RoE estimate from our implementation of the SLCAPM).

We also do not consider the empirical estimates of the RoE from long term (historical) specification of the SLCAPM, or from Wright specifications of the SLCAPM, put forward by any of the NSPs and their consultants provides material that alone, or in combination with other material, demonstrate our RoE from the foundation model will not meet lead to a RoR that meets the RoR objective.

B Market risk premium

This appendix sets out why we consider our approach for estimating the market risk premium (MRP) contributes to achieving the allowed rate of return objective.[769] 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.[770] 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.[771]

B.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.[772] We are satisfied this is the most robust source of evidence for estimating a 10 year forward looking MRP. This position is consistent with the Rate of Return guideline (Guideline).[773] Therefore, we have the most reliance to this source of information in estimating the MRP.

Under current market conditions, we consider historical excess returns produce a MRP estimate of 6.0 per cent from within a range of 5.1 to 6.5 per cent.[774]

In the following sections we:

- update the estimates to add data up to the 2013 calendar year end
- consider what sampling period to apply
- consider our use of arithmetic and geometric means
- consider concerns about the underlying dataset for the period 1883 to 1958.

B.1.1 Updated estimates

Table 3-39 sets out arithmetic and geometric average historical excess returns estimated over different sample periods up until the 2013 calendar year end.[775] Arithmetic averages range between 5.9 and 6.5 per cent and geometric averages range between 4.0 and 4.9 per cent.

---

769 NGR r. 87(6).

770 NGR r. 87(7).

771 AER, *Rate of return guideline*, 17 December 2013, p. 16.

772 See steps one and two under section 1.4.1 of the attachment for our assessment of this information against our criteria.

773 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 78.

774 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. We have since updated these estimates to the 2013 calendar year end. Consistent with the approach in the Guideline, we set the bottom of the range as 20 basis points above the highest estimate from the range of geometric averages.

775 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.

Table 3-39 Historical excess returns assuming a theta of 0.6 (per cent)

Sampling period	Arithmetic mean	Geometric mean
1883–2013	6.3	4.9
1937–2013	6.0	4.1
1958–2013	6.5	4.0
1980–2013	6.4	4.0
1988–2013	5.9	4.1

Source: AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 82; AER updates.

The estimates in Table 3-39 incorporate the value of imputation credits. We estimate investors value imputation credits at 60 per cent of their face value. That is, the utilisation rate (theta) is 0.6. This is consistent with other parts of this draft decision (see the gamma attachment).

B.1.2 Sampling period

We consider five sampling periods: 1883–2013, 1937–2013, 1958–2013, 1980–2013 and 1988–2013. Brailsford et al. use these estimation periods, stressing that clearly identifiable and material changes in the underlying data determine these periods. These include:[776]

- 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.[777]
- 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. It is also (approximately) the first year for which marketable short term government securities were issued.
- 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 a number of strengths but at least one weakness. Specifically:[778]

- Longer time series contain a greater number of observations, so produce a more statistically precise estimate.
- Significant increases in the quality of the data become available in 1937, 1958 and 1980.

---

776 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 76–77, 85–86.

777 The Commercial and Industrial price index only included 5 stocks in 1875, 12 in 1905 and 47 in 1945.

778 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 82.

- 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.[779]

B.1.3 Arithmetic and geometric averages

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, one year returns estimate historical excess 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.[780]

- We have previously considered arithmetic and geometric averages relevant when estimating a 10 year forward looking MRP using historical annual excess returns.[781] The Australian Competition Tribunal found no error with this approach.[782]

- 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.[783] While we do not adopt this approach, this indicates that experts and other regulators can consider geometric averages valuable.

- McKenzie and Partington advised that 'the unbiased estimator of the MRP lies between the arithmetic average and the geometric average'.[784]

- While we acknowledge geometric averages may exhibit downwards bias, we also note that arithmetic averages may exhibit upwards bias. This is because:[785]

> 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.

---

779 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.

780 For an additional example, see AER, *Draft decision: SPI Networks access arrangement*, September 2012, Appendix B.2.1.

781 For example, see AER, *Final decision: SPI Networks (Gas) access arrangement*, March 2013, Part 3, B.5.1.

782 Australian Competition Tribunal, *Application by Envestra Ltd (No 2) [2012] ACompT4*, 11 January 2012, paragraph 157.

783 Wright and Smithers, *The cost of equity capital for regulated companies: A review of Ofgem*, 2014, p. 9.

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

785 McKenzie and Partington, *Report to the AER: Supplementary report on the equity MRP*, 22 February 2012, p. 6.

B.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.[786] 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 underlying series'.[787] 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:[788]

- 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 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:[789]

  > 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 ASX was reasonable. They confirmed the adjustment was reasonable and concluded:[790]

  > 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 Economic Consulting (NERA), which proposed an alternative adjustment to the Lamberton dataset.[791] 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

---

786 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).

787 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 75.

788 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 79–81.

789 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.

790 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 81.

791 NERA Economic Consulting, *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);

a peer reviewed academic journal published.[792] Brailsford et al. found, 'an adjustment factor somewhere in the range of 0.65–0.75 would be defensible'.[793]

Further, we have 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.[794] For this reason, it seems likely that NERA has different data to Lamberton. If this is the case, then any adjustment to the Lamberton series based on NERA's findings is unlikely to be appropriate. We note that the difference in NERA's data could make a significant difference in terms of NERA's proposed adjustment. Handley observed: [795]

> 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.[796]
- 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.[797] Further, NERA's estimated adjustment is only smaller than the ASX adjustment for four of their data points.[798] 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.[799]

Further, even if NERA persuaded us to adopt its adjustment to earlier data, this would not change our estimate of the MRP based on historical excess returns. This is because:[800]

- When estimating an MRP from historical excess returns, we have regard to a number of different time periods and averaging methods. Table 3-40 shows NERA's adjustment would affect some of these time periods, but not all. When implemented, NERA's adjustment does not materially alter the span or cluster of 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.[801] 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'.[802] 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

---

792 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008.
793 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 81.
794 NERA, *The market, size and value premiums*, June 2013, p. 11.
795 Handley, *Advice on the return on equity*, 16 October 2014, p. 20.
796 NERA, *The market, size and value premiums*, June 2013, pp. 7–8.
797 NERA, *The market, size and value premiums*, June 2013, p. 11.
798 NERA, *The market, size and value premiums*, June 2013, table 2.2; Handley, *Advice on the return on equity*, 16 October 2014, p. 19.
799 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008.
800 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 83–84.
801 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 79–81.
802 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 75.

MRP estimates relative to true expectations because historical returns are only estimated on stocks that have survived.[803] This upward bias is a relevant consideration because various Australian stock indexes exclude failed stocks.[804]

Table 3-40 NERA's adjusted historical excess returns, 0.6 theta (per cent)

Sampling period	Arithmetic mean (without NERA adjustment)	Arithmetic mean (with NERA adjustment)
1883–2013	6.3	6.6
1937–2013	6.0	5.9
1958–2013	6.5	6.5
1980–2013	6.4	6.4
1988–2013	5.9	5.9

Source: AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 83; AER updates.

B.2 Dividend growth models

We can use DGMs to derive the return on equity.[805] DGMs derive the return on equity that makes the forecast dividends for a business consistent with the market value of its equity.[806] 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[807]
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 C sets out detailed reasons for our preferred construction of the DGM. This construction is consistent with that set out in our Guideline.[808]

803 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. M 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.

804 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.

805 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.

806 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

807 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.

808 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.

Our preferred construction of the DGM produces an estimate of the MRP within the range of 6.6 to 7.8 per cent for the two months ending September 2014. Table 3-41 shows how we construct this range from DGM estimates under different assumptions.

Table 3-41 MRP estimates under dividend growth models, 0.6 theta (per cent)

Growth rate	Two stage model	Three stage model
4.0	6.6	7.0
4.6	7.2	7.4
5.1	7.7	7.8

Source: Bloomberg, AER analysis.

We note that the DGM range is formed using a narrow set of assumptions. We have conducted a sensitivity analysis in our appendix on the DGM (see section C.5). This shows that, like all DGM analyses, estimates vary considerably when we alter assumptions within a reasonable range.

B.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 C).[809] 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 to critically review our construction of the DGM.[810] We consider their advice suggested that, overall, our construction of the DGM is reasonable.[811]
- 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.[812] These submissions have not convinced us to depart from our construction of the DGM, which we consider to be more suitable for regulatory purposes (see appendix C).
- 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'.[813] We base this estimate on expert advice by Lally.[814] See C.2.1 of appendix C for how Lally produces this estimate.

Further, we have assessed SFG's and our construction of the DGM against our criteria (see C.2.7 of appendix C). This analysis explains why we are satisfied our construction of the DGM is more robust than SFG's construction.

---

809 JGN, ActewAGL, the NSW DNSPs and TransGrid 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.

810 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.

811 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.

812 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.

813 McKenzie, 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).

814 Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, p. 14.

B.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. We have some reliance on survey estimates in estimating the MRP. Our assessment of survey evidence against our criteria informs our use of this information.[815]

Table 3-42 sets out key findings from market surveys published since 2013. Estimates from these surveys cluster around 6.0 per cent.

Table 3-42 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 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.[816] In its report for several service providers, SFG submitted that we used this information to inform our MRP in the Guideline.[817] SFG based this on the reliance we gave to the surveys, Ernst & Young (2012) and KPMG (2013).[818] In this draft 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.[819]

B.4 Conditioning variables

We can use conditioning variables to adjust the mean historical excess return. 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 most useful for indicating changes in general market conditions.[820] This can be valuable because having regard to the prevailing conditions in the market

815 For our assessment, see steps one and two of the rate of returns attachment to this draft decision.
816 See steps one and two of the rate of returns attachment to this draft decision.
817 SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 74.
818 Ernst & Young, *Market evidence on the cost of equity*, 8 November 2012; KPMG, *Valuation Practices Survey 2013*, February 2013.
819 KPMG, *Valuation Practices Survey 2013*, February 2013, p. 1.
820 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 93–100.

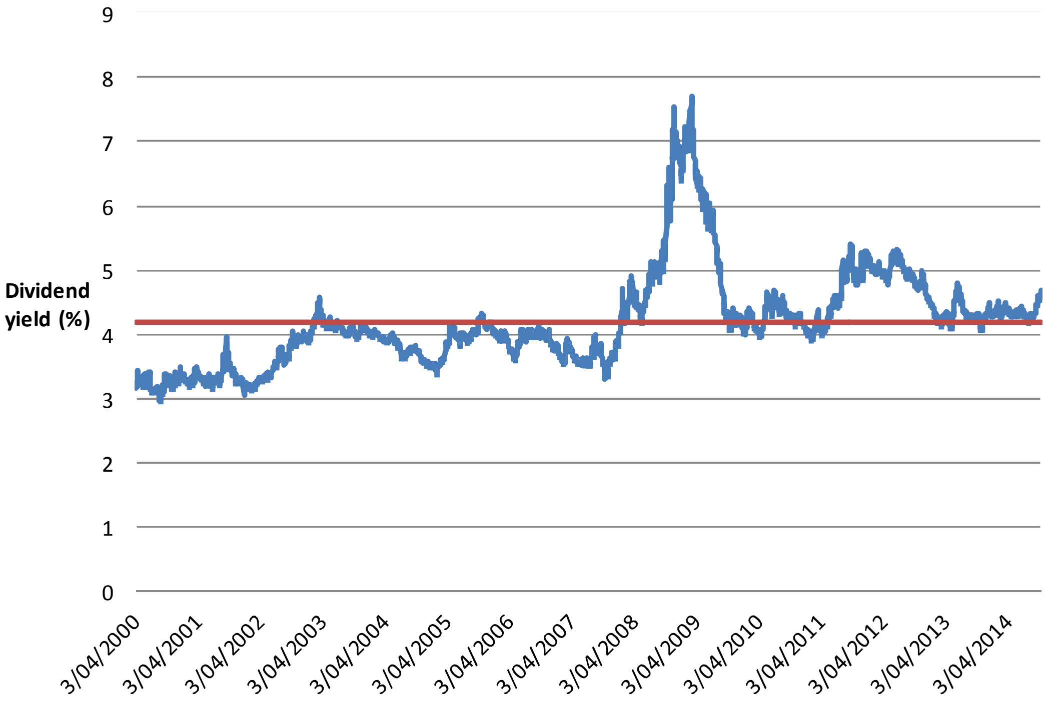
for equity funds is consistent with the rules.[821] Our assessment of conditioning variables against our criteria informs this position.[822] From this assessment, we found there are some important limitations to this source of evidence. However, we also found this information valuable for detecting 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.[823] Recently, when implied volatility estimates have fallen, service providers have not considered this evidence.[824] Similarly, service providers and their consultants have proposed dividend yields as a useful indicator for the MRP when these supported higher estimates.[825]

B.4.1 Dividend yields

We use dividend yields as a directional indicator of the return on equity.[826] We consider this information by comparing current dividend yields with the average dividend yield through time.[827] Figure 3-14 shows dividend yields against their historical average.

Figure 3-14 Dividend yields



Source: Bloomberg, AER analysis.

821 NER ccl. 6.5.2(g), 6A.6.2(g); NGR r. 87(7).
822 See steps one and two of the return on equity attachment.
823 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.
824 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.
825 For example, CEG, *Update to March 2012 Report: On consistency of the risk free rate and MRP in the CAPM*, November 2012, pp. 15-16; SFG, *Market risk premium: Report for APT Petroleum Pipelines Ltd*, October 2011, pp. 13–14.
826 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 94.
827 For a similar approach, see SFG, *Market risk premium: Report for APT Petroleum Pipelines Ltd*, October 2011, p. 13.

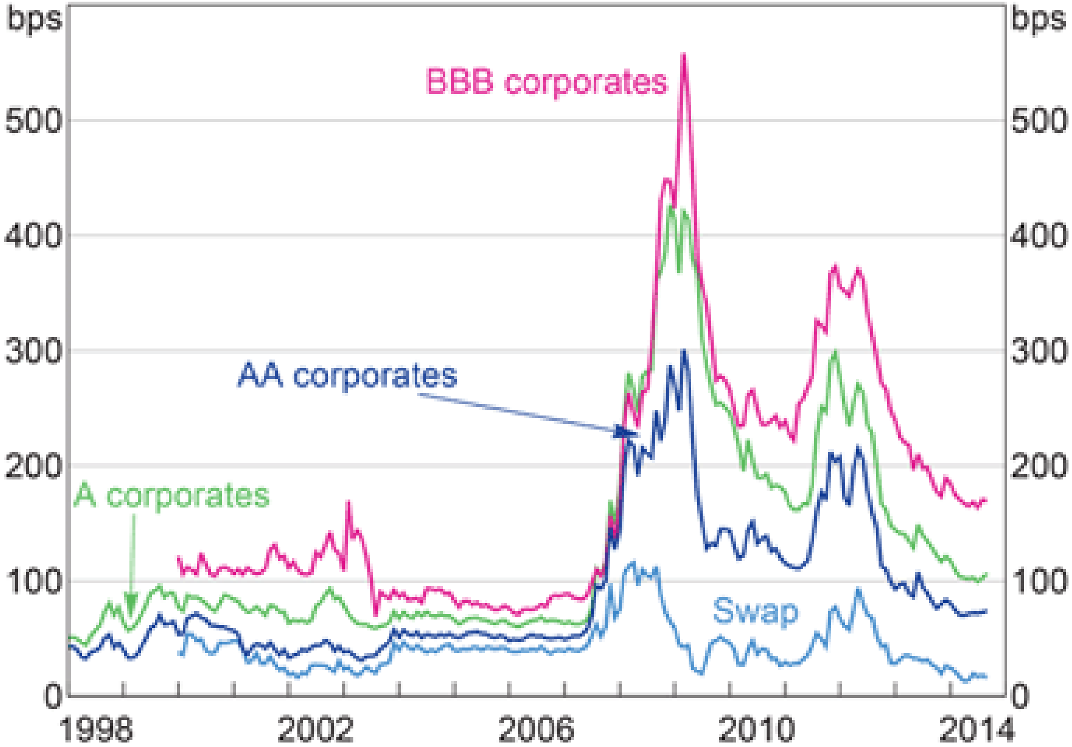
Figure 3-14 shows, in October 2014, dividend yields were close to their historical averages. These have been relatively steady over the last 12 months. We consider this suggests market conditions are relatively stable.

B.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 to indicate directional changes in market conditions.[828] That is, to indicate whether spreads are widening, stabilising or falling.

Figure 3-15 shows credit spreads for a range of debt instruments over yields on Commonwealth government securities (CGS). The RBA publishes this graph monthly. This shows that most credit spreads are above their pre-2007 levels, while the swap rate spread is at or below its pre-2007 levels. In essence, lower quality debt is further from pre-2007 levels than higher quality debt. All spreads show a clear downward trend over the past twelve months or so, but appear to be levelling off.

Figure 3-15 Australian bond spreads over government yields

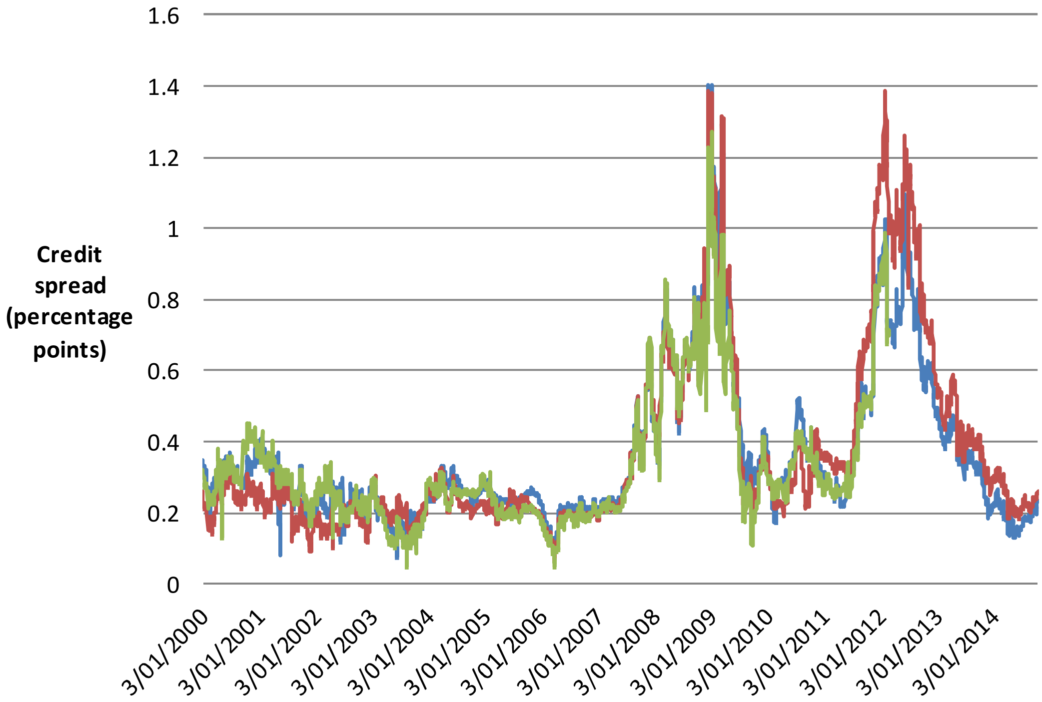


Source: RBA, Chart Pack, 8 October 2014.
Note: Swap spreads are for a 3 year maturity. Corporate bonds are a weighted average of senior bonds with remaining maturities of 1 to 5 years and include financial and non-financial corporates.

Figure 3-16 shows the spread between state government debt and CGS. This uses maturities of three years as more data are available.

828 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, p. 96.

Figure 3-16 State government bond spreads over government yields



Source: RBA, AER analysis.

Figure 3-16 shows that credit spreads have fallen for about 2.5 years. Credit spreads appear to be levelling off and are around pre-2007 levels. We consider this suggests market conditions are stabilising.

B.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).[829] In the past, Value Adviser Associates (VAA) submitted we apply an implied volatility 'glide path' to 10 years.[830] This is because implied volatility generates a 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.[831] 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). However, recent implied volatility levels have been below the long run average of 18.3 per cent (measured from the start of the data series in 1997). On 15 October 2014, the ASX200 implied volatility index (VIX) was 16.3 per cent. Using the same averaging period as the indicative risk free rate, the ASX200 VIX was 15.5 per cent.[832] Figure 3-17 shows the value of this measure of implied volatility relative to its long run average level across the period since the GFC.

---

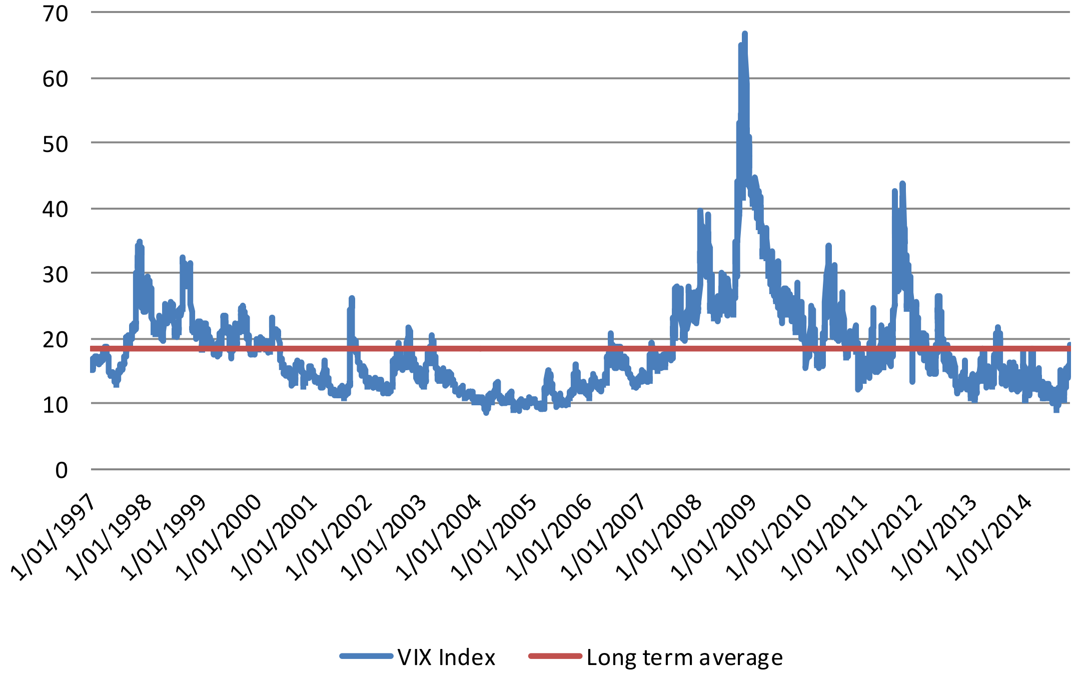
829 This was based on Merton, R.C., 'On Estimating the Expected Return on the Market: An Exploratory Investigation', *Journal of Financial Economics*, 1980, Vol. 8, pp. 323–361.

830 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.

831 AER, *Explanatory statement rate of return guideline (appendices)*, 17 December 2013, pp. 98–99.

832 This indicative averaging period is 17 September 2014 to 15 October 2014.

Figure 3-17 Implied volatility (VIX) over time



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

B.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.[833] This provides a comparison of what other regulators consider to be a reasonable estimate of the MRP. This information does not inform our MRP estimate. Rather, we use this as a check on how we are considering information before us.

Table 3-43 sets out the MRPs adopted by other Australian regulators responsible for economic regulation across the electricity, water and rail industries. These estimates range from:

- 6.0 to 7.1 per cent using mid points— the estimates effectively applied in regulatory determinations.
- 5.5 to 8.7 per cent using ranges. That is, the ranges in which the MRP could potentially fall within.

Table 3-43 Recent regulatory decisions

Regulator	Decision date	Sector	MRP (%)
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)
Utilities Commission	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)

833 AER, *Explanatory statement: Rate of return guideline (appendices)*, 17 December 2013, pp. 100–102.

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)
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: IPART, ERA, ESCV, ESCOSA, QCA, Utilities Commission.[834]

B.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 because under an imputation tax system, some personal tax payments will be capitalised into the risk premium.[835]

The risk premium will reduce when some personal tax payments are capitalised into the risk premium. Therefore, we need to adjust the MRP to include the 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.[836]

B.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 franking credits at 60 per cent of their face value (see the gamma attachment). Therefore, we must add back the value of imputation credits

834 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; Utilities Commission, *Network price determination, Part A —Statement of reasons*, April 2014, p. 120;IPART, *Essential Energy's water and sewerage services in Broken Hil*l, June 2014, p. 161 ; 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.

835 Officer, 'The cost of capital under an imputation tax system', *Accounting and Finance*, May 1994, 34, p. 1.

836 Officer, 'The cost of capital under an imputation tax system', *Accounting and Finance*, May 1994, 34, pp. 1, 10.

to the stock accumulation index. Otherwise, we will underestimate the after-corporate, before-personal tax return on equity.[837]

Brailsford et al. estimated a series for the value of imputation credits. This entailed the following:[838]

- 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.[839]
- Adjusting the series of estimated imputation credit yields for the amount that investors value them (theta). We estimate that investors value 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).[840] As such, we have confidence in these estimates. We note that Handley also applied this methodology when he updated the Brailsford et al. study.[841]

Our adjustment for imputation credits in historical excess returns is consistent with the adjustment NERA applied when estimating historical excess returns.[842] The majority of service providers proposed NERA's estimated historical excess returns.[843] This is because NERA used the Brailsford et al. method to adjust for the value of imputation credits.[844] This adjustment is also consistent with our adjustment to account for imputation credits in the DGM.

B.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.[845] 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

---

837 Officer, 'The cost of capital under an imputation tax system', *Accounting and Finance*, 1994, 34, 1–17.

838 Brailsford, Handley, Maheswaran, 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 84–85.

839 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).

840 This is known as 'the utilisation rate' or 'theta' (θ).

841 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.

842 NERA, *The market, size and value premiums*, June 2013.

843 JGN and ActewAGL submit SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 51. SFG uses estimates of historical excess returns in NERA, *The market, size and value premiums*, June 2013. TransGrid applies 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. The NSW DNSPs apply a return on capital estimated by CEG, *WACC estimates: A report for NSW DNSPs*, May 2014, p. 27.

844 NERA, *The market, size and value premiums*, June 2013, p. 46.

845 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.[846] Therefore, we have confidence in this method, which entails adjusting dividends directly for the value of imputation credits.

B.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 report for several service providers, SFG estimated the MRP implied by a DGM. For this estimate, SFG applied an adjustment for imputation credits, which it considered uses Officer's (1994) formula.[847] SFG performed this adjustment as follows:[848]

$$Market\ ROE\ with\ imputation\ benefits = Market\ ROE\ excluding\ imputation\ benefits\ \times \left[1 + \frac{\gamma\tau}{1-\tau}\right]$$

$$Market\ ROE\ with\ imputation\ benefits = 10.12\% \times \left[1 + \frac{0.5\times 0.3}{1-0.3}\right] = 12.29\%$$

SFG then derived a 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 calculation for a gamma of 0.4 yields an MRP estimate of 7.73 per cent.[849]

This adjustment differs from the adjustment typically used in the past, and to that in the Guideline. We do not agree with this proposed departure from the Guideline.[850] This is for the following reasons:

- 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 applied to Aurizon:[851]

  > 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.[852] McKenzie and Partington advised that it is problematic to gross up a post-tax return to get a pre-tax return

---

846 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.

847 SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 41, 73.

848 We have rearranged the expression in SFG's report, $ROE\ excluding\ imputation\ benefits\ \div \left[1 + \frac{!-T\tau}{1-T(1-\gamma)}\right]$. See SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, p. 73.

849 Under this approach, when gamma equals 40%, the return on equity with imputation credits equals 10.12/(0.7/(1-0.3*0.6)) = 11.85%. Deducting a risk free rate of 4.14% results in a MRP of 7.73%.

850 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.

851 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.

852 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.

because the adjustment applied in the Officer (1994) formula, 'can only be relied on for perpetual cash flows'.[853] Handley also observed:[854]

> 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 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).[855] We do not find SFG's reasoning convincing (see section B.6.4).

Adjusting survey evidence

SFG proposed adjusting MRP estimates in market surveys.[856] We do not agree with this position 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.[857]

- 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.[858]

- McKenzie and Partington advised:[859]

> 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:[860]

> 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 this adjustment as SFG has proposed. We set out our reasons for this position under 'adjusting the dividend growth model' in section B.6.3.

Adjusting independent valuation reports

We do not use independent valuation reports to inform our estimate of the MRP.[861] SFG proposed adjusting MRPs estimated in independent valuation reports for the value of imputation credits.[862] We do not consider it necessary to adjust these estimates for our purposes. This is because we only use

---

853 McKenzie and Partington, *Report to the AER: The DGM*, December 2013, p. 24.
854 Handley, *Advice on the return on equity*, 16 October 2014, p. 22.
855 SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, p. 41.
856 SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 71, 78.
857 Truong, Partington, Peat, 'Cost of capital estimation and capital budgeting practice in Australia', *Australian Journal of Management*, 2008, 33, pp. 95–121.
858 McKenzie, Partington, *Supplementation report on the equity MRP*, February 2012, pp. 16–17.
859 McKenzie, Partington, *Supplementation report on the equity MRP*, February 2012, p. 17.
860 Lally, *Response to submissions on the risk-free rate and the MRP*, October 2013, p. 15.
861 See steps one and two of the return on equity attachment to this draft decision.
862 SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 71, 78.

independent valuation reports to compare current estimates to a baseline value (directional information).[863] Since we are only interested in the relative value of these estimates, as long as the return on equity in independent expert reports is measure 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:

- 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.[864]

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 B.6.3. We do not agree with applying this adjustment as SFG has proposed. We set out our reasons for this position under 'adjusting the dividend growth model' in section B.6.3.

Our discussion of independent valuation reports in step four shows, for comparative purposes, return on equity estimates that are both adjusted for dividend imputation and unadjusted. For this purpose,[865] 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 franking rebate yield (as published by the ATO) multiplied by the franking credit utilisation rate.[866]

B.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.[867] 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.[868] The relevant value is the return on equity including the value investors receive from imputation credits. Therefore, SFG adjusted its starting estimates using the Officer (1994) relationship:[869]

$$ROE\ including\ imputation\ benefits = ROE\ excluding\ imputation\ benefits \times \left[1 + \frac{\gamma T}{1-T}\right]$$

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 because it is inconsistent with the adjustment we and service providers apply to estimate historical excess returns. Also, Officer (1994)

863 AER, *Explanatory statement rate of return guideline*, 17 December 2013, p. 61.
864 CEPA, *Australian energy regulator: Victorian gas networks market evidence paper*, February 2013.
865 Our discussion in step two and in appendix E2 outlines our concerns with grossing up return on equity estimates from independent valuation reports to account for dividend imputation.
866 This is also the approach adopted by Brailsford, Handley, and Maheswaran (2012) when estimating historical excess returns.
867 See SFG, *The required return on equity for regulated gas and electricity network businesses*, 27 May 2014, pp. 41, 73; 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, pp. 61–63.
868 We do not agree, as set out in the previous section.
869 R. Officer, 'The cost of capital of a company under an imputation tax system', *Accounting and Finance*, May 1994.

derives this formula as a perpetuity relationship.[870] This can create an internal inconsistency because SFG has proposed we apply a perpetuity formula to non-perpetuity returns estimated from DGMs, independent expert reports and market surveys.[871] This assumes returns are comprised of 100 per cent dividends, whereas returns include both dividends and capital gains in practice.

SFG appears to justify using the Officer (1994) adjustment on the basis that we make the same adjustment in our PTRM, and that external consistency with the PTRM is the only relevant consideration.[872] 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 not apply the Officer relationship in the manner SFG described.[873] For example, SFG's position is different to 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.[874] 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.[875]
- 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.[876] This differs from the outcome produced in SFG's example proof in its 2013 report.[877] 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 (which were perpetuity-consistent) selected by SFG.[878] This reflects our adoption of the Officer framework as a base for the model.

[870] R. Officer, 'The cost of capital of a company under an imputation tax system', *Accounting and Finance*, May 1994, p. 3.

[871] 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.

[872] That is, SFG does not state that its approach is theoretically correct. See 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, p. 63. SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, p. 39.

[873] *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.

[874] The value ascribed to imputation credits (gamma) is an input into the PTRM.

[875] 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.

[876] 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.

[877] SFG, *Dividend discount model estimate of the cost of equity*, 19 June 2013, pp. 37–40.

[878] 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

- In practice, we populate the PTRM with non-perpetuity inputs. As a simple example, consider the case where carryover tax losses 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 were 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.[879]

- 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.[880] In table 3-44, 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 3-44, 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 3-44 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
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.

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.

879 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.

880 Cells E60 and E61 on the analysis tab on the standard transmission PTRM.

B.6.5 Assessment against our criteria

We must have regard to relevant estimation methods, financial models, market data and other evidence.[881] In the Guideline, we proposed using criteria to assess the merits of the various sources of information in setting the allowed rate of return.[882] Since service providers proposed an alternative adjustment for imputation credits (see section B.6.3), we have had regard to this as an estimation method.

Table 3-45 Assessment of imputation adjustments against AER criteria

Criteria[883]	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.[884] 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.[885] 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 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.

Source: AER analysis.

---

881 NGR, r. 87(5)(1).

882 AER, *Rate of return guideline*, 17 December 2013, p. 6.

883 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.

884 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.

885 Officer, 'The cost of capital under an imputation tax system', *Accounting and Finance*, May 1994, 34.

C 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.[886] Consistent with the rate of return guideline (Guideline), we use DGMs only to inform our estimate of the MRP.[887]

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 report for several service providers.[888] This also includes an assessment of SFG's and our DGMs against our criteria.
- Our reasons for using the DGM to inform the MRP. We also provide reasons for not using DGMs to inform the overall return on equity.
- Prevailing estimates of the MRP using our preferred construction of the DGM.
- Some sensitivity analysis surrounding our prevailing estimates.

C.1 Preferred construction of the dividend growth model

Our preferred construction of the DGM is consistent with that set out in the Guideline.[889] The following equation depicts the 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[890]
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.
The relevant financial year for the S&P/ASX 200 index is 1 January to 31 December.

We adopt two versions of a simple standard DGM:

[886] 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.

[887] AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 84.

[888] 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.

[889] 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.

[890] 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 two stage DGM, which assumes that dividends grow at the long term growth rate following the dividend forecast period.
- A three stage model, which assumes that dividend growth transitions linearly over eight years from the short term growth rate implied in the dividend forecast period to the long term growth rate.

Our 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.

C.2 Reasons for the preferred construction

There are various high level reasons why we have confidence that 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.[891] We have considered a variety of submissions on our construction of the DGM,[892] which have not convinced us to depart from our construction of the DGM.[893] Further, experts have critically reviewed our construction of the DGM.[894] We consider this advice suggests that, overall, our construction of the DGM is reasonable.[895] 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.

C.2.1 The long term dividend growth rate

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'.[896] We derive this by:

- 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 larger 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.[897] When producing this estimate, Lally had regard to the following:[898]

---

891 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.

892 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.

893 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.

894 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.

895 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.

896 McKenzie, 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).

897 Lally, *The dividend growth model*, 4 March 2013, p. 13.

898 Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, p. 14.

> 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.[899] In determining what deductions to apply, Lally considered the following:[900]
  - 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.[901] However, Lally considered this comparison would exaggerate the relevant adjustment in the presence of a declining dividend payout rate.[902]
  - 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.
  - 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.[903] 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.[904] In contrast, we apply an estimate of 4.6 per cent.

In its report for several service providers, SFG questioned our view that the long term dividend growth rate could not exceed long term growth in GDP.[905] 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

---

899 Bernstein, Arnott, 'Earnings Growth: The Two Percent Dilution', *Financial Analysts Journal*, September/October 2003.

900 Lally, *The dividend growth model*, 4 March 2013, p. 14.

901 Bernstein, Arnott, 'Earnings Growth: The Two Percent Dilution', *Financial Analysts Journal*, September/October 2003, table 1.

902 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.

903 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 34; McKenzie, Partington, *The DGM*, December 2013, p. 24.

904 The extreme values include the Lally/Barra growth estimate of 0.31% and the CEG estimate of 6.5%. See McKenzie, Partington, *The DGM*, December 2013, p. 15.

905 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 3.

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.[906]

- We accept that the above point is a long term argument.[907] However, in SFG's and our DGMs, the long term dividend growth rate is 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[908] SFG submitted this is because listed firms empirically exhibit dividends and earnings growth above our long term growth estimate.[909] 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.[910] McKenzie and Partington also noted that this difference:[911]

> 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.

C.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).[912] 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.[913]

However, we consider our two stage and three stage DGMs, which are standard DGMs, preferable to SFG's proposed model for the following reasons:

- 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.[914] Further, many previous consultant reports from service providers have submitted we use a standard DGM.[915] Since standard DGMs are more widely used, we can have

---

906 McKenzie, Partington, *Report to the AER: The Dividend Growth Model (DGM)*, 14 December 2013, p. 13.
907 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 33.
908 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'.
909 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 6.
910 See McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October, p. 26
911 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 33.
912 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).
913 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).
914 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.
915 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 M, *The dividend growth model, Victoria University of Wellington*, 4 March 2013, pp. 13–15; Lally, *The cost of capital under imputation, prepared for the* ACCC, 2002, pp. 29–34.

greater confidence they have been 'tried and tested'. Handley has considered SFG's model and advised:[916]

> The model is interesting but the regulatory environment involving an aggregate regulatory asset base measured in the tens of billions of dollars is not an appropriate setting to trial a new model whose widespread use and acceptance is yet to be established.

- 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 model, they doubted they could replicate SFG's results given the same dataset.[917]
  - Complex models are more difficult to administer. For instance, our DGM is very simple to implement. First, we download the data from the Bloomberg and apply it to a simple 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.[918] For instance, estimating the MRP over 10.5 years using SFG's model appears to require more than 128 million individual computations.[919]
  - 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 rules place an emphasis on service providers engaging with their customers.[920]
  - 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.[921]

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 model has been justified. This is consistent with our consultant's views. McKenzie and Partington advised that while the SFG's model is interesting, it is unclear that it achieves any real improvement in the accuracy of the cost on equity estimate.[922] Specifically, McKenzie and Partington were unconvinced about the merits of SFG's model, and described it as 'an additional choice among many'. They noted:[923]

> A reasonable requirement, before adopting the SFG model as a preferred choice over well established models, would be substantial agreement on it superiority in the research literature and/or extensive use in practice.

---

916 Handley, *Advice on the return on equity*, 16 October 2014, p. 15.
917 McKenzie, Partington, *Report to the AER: The DGM*, 14 December 2013, p. 21.
918 SFG calls the market value return on equity, the 'cost of equity'.
919 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.
920 National Electricity Rule, clause 6.8.2(c1)(2)). Similarly, 16(1)(b) of the National Electricity Law requires we inform stakeholders of material issues under consideration and give them a reasonable opportunity to make submissions.
921 AER, *Explanatory Statement Rate of Return Guideline*, December 2013, p. 28.
922 McKenzie, Partington, *Report to the AER: The Dividend Growth Model (DGM)*, December, 2013, p. 5.
923 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 27.

Importantly, 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.[924] 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. 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.[925] We recognise this is an extreme example. Further, SFG has attempted to filter out unrealistic results by constraining the available choices and requiring their estimates to meet certain criteria. However, this approach is still subject to the following limitations:

- Despite the existence of filtering criteria, SFG's model has still produced unrealistic results. In particular, SFG's DGM produces a long term dividend growth rate that is larger than long term growth in GDP. This is nonsensical because in the long term, if aggregate dividends outgrew the overall economy, the stock market would grow larger than the overall economy in the long term.[926]

- This approach alters where one makes assumptions, rather than eliminating the problem of having to make assumptions. As McKenzie and Partington described:[927]

  > 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.[928] 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'.[929] 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.[930] McKenzie and Partington found:[931]

  > 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 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.

In addition to not being convinced with endogenous growth models, we are not convinced with the particular model SFG have put before us. This is for the following reasons:

- The endogenous growth rate used by SFG gives an implausibly high long term dividend growth rate which is larger than the long term GDP growth rate, averaging at about 5.8 per cent.[932] 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

---

924 For example, see SFG, The *required return on equity for regulated gas and electricity network businesses*,6 June 2014, pp. 62–63; NERA, *Return on Capital of a Regulated Electricity Network: A report for Ashurst*, May 2014, p. 105.

925 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.

926 McKenzie, Partington, *Report to the AER: The Dividend Growth Model (DGM)*, 14 December 2013, p. 13.

927 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 35.

928 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.

929 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 26.

930 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 35.

931 McKenzie and Partington call the market value return on equity, the 'cost of equity'. McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 35.

932 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 51.

long term. Such an outcome is not plausible as the stock market is a component of the overall economy. McKenzie and Partington supported this.[933] Therefore, one should consider long term GDP growth an upper bound for the long term growth in aggregate dividends. Further, the upper bound for the growth in dividends per share should be even less. Lally has advised that this reflects the impact of new share issues (net of buyback) and the formation of new companies.[934]

- While SFG has substantiated its DGM by outlining that its methodology has been published in a respected journal (Fitzgerald et al.), there are unexplained differences between Fitzgerald et al.'s and SFG's DGMs.[935] We consider these differences contribute to the opaqueness of the SFG's DGM and should be explained. These 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.[936]
  - 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. 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.[937]
  - Fitzgerald et al. uses a residual income model, while the SFG model is not.[938]
  - 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.[939]
- In its model, SFG imposed unexplained restrictions on the data. For instance, SFG assumed that growth in shares cannot be negative.[940] We consider this assumption is unrealistic given share buybacks are widely used.

C.2.3 Term structure of interest rates

Our preferred construction of the DGM assumes no 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.[941]

---

933 McKenzie, Partington, *Report to the AER: The Dividend Growth Model (DGM)*, 14 December 2013, p. 13.
934 Lally, *Review of the AER's proposed Dividend Growth Model*, 16 December 2013.
935 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.
936 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.
937 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.
938 Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., p. 573.
939 Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., p. 575.
940 SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, p. 11.
941 Lally, *The DGM*, 4 March 2013.

Assuming no term structure means there is a single discount rate rather than a different discount rate for each future period. While this is a strong assumption, analysts commonly apply it to DGMs.[942] We do not apply a term structure for the following reasons:

- It is not standard practice to apply a term structure to the DGM.[943]
- Applying a term structure to the DGM will materially increase the complexity of the DGM. 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:[944]

> 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'.[945]
- We consider it is unclear whether the market value return on equity in the DGM with a term structure will be any more accurate than the DGM with a flat term structure. For instance, even if we were certain of a term structure, estimating the market value return on equity for more distant cash flows would be very difficult. This leads McKenzie and Partington to agree with SFG in observing:[946]

> 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 assume no term structure in our DGMs, we have regard to the fact that a term structure is likely to exist. We recognise, due to its existence, our DGMs are likely to overestimate the MRP in relatively low interest rate environments. Similar, our DGMs are likely to underestimate the MRP in relatively high interest rate environments. We base this on the following factors:

- Lally advised we adopt a term structure within the DGM. He noted that, under a DGM with a constant term structure: [947]

> 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…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.

---

942 Lally and CEG both agree analysts general 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.

943 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.

944 McKenzie and Partington call the market value return on equity, the 'cost of equity'. McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 36.

945 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 36.

946 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, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 37.

947 Lally, *Review of the AER's proposed dividend growth model*, 16 December 2013, pp. 11–12.

- 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'.[948]

C.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 away. If the growth in dividends in the two years is abnormally high (low), either 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.

- While a three stage DGM is conceptually better than a two stage DGM, its relative accuracy depends on how closely our assumed pattern of transition reflects reality. While we have assumed a linear transition, this may not necessarily reflect reality. For instance, McKenzie and Partington advised:[949]

  > 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 DGM 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.[950] However, McKenzie and Partington recommended a transition of three to five years based on the length of businesses cycles.[951] 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'.[952]

---

948 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.

949 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 32.

950 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 6.

951 Evidence from Pagan (1998) provides an average expansionary phase of approximately 3 year for the Australian stock market. See McKenzie and Partington, *Report to the AER, Part A: Return on equity*, 8 September 2014, p. 17. Also see Pagan, A.R. 1998, 'Bulls and bears: a tale of two states', Walras-Bowley Lecture, Montreal.

952 McKenzie and Partington call the market value return on equity, the 'cost of equity'. McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 33.

- 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 assumption.

C.2.5 Consensus dividend forecasts

We use overall market consensus dividend forecasts in 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.

SFG, on the other hand, proposed an approach that entails initially estimating the market value return on equity at an individual analyst forecast level using individual analyst forecasts. 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 C.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.

d. Determine a MRP for a six month interval by subtracting the prevailing risk free rate.

We do not consider this high level of computational intensity justified. In particular:

- Any benefits from matching price data to dividend data are questionable. This is because SFG averages its individual businesses' estimates to determine a half yearly market value return on equity estimate. This averaging process will likely eliminate the benefit of matching price and dividend data.

- Both approaches appear to produce similar estimates of the return on equity.[953] SFG has also observed this.[954] We question the benefit of estimating the return on equity over 128 million times when we can obtain the same result by estimating the return on equity once monthly using consensus forecasts.[955]

- While SFG has found its approach decreases dispersion in market value return on equity estimates:

    - Dispersion is not necessarily problematic—particularly to the extent that the actual return on equity is volatile.[956]

953 By 'both approaches' we mean SFG's model with consensus forecast and SFG's model with individual analyst forecasts.
954 SFG, *Dividend discount model estimate of the cost of equity*, 19 June 2013, p. 10.
955 We use daily data, which we average across the month before applying it to our DGM.
956 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 8.

- SFG's estimates will be less volatile than our monthly estimates by definition because SFG averages its individual market value return on equity estimates to determine a semi-annual estimate.

- 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.[957]

- 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.[958]

- 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 because of a change in the market value return on equity. However, under SFG's approach, it averages all forecasts over the six months. This includes out dated forecasts and gives greater weight to analysts that revise their forecasts more frequently.[959] 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'.[960]

C.2.6 Market prices

We consider one should use market prices in the DGM. The DGM is a discounted cash flow model based on the assumption that the current price of share is equal to the discounted value of all expected future dividends. According to the DGM, 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:

$$P_0 = \frac{E(D_1)}{(1+k)^1} + \frac{E(D_2)}{(1+k)^2} + \frac{E(D_3)}{(1+k)^3} + \frac{E(D_4)}{(1+k)^4} + \cdots$$

SFG submitted that we should use target prices in this equation. 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 the DGM.[961]

---

[957] McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 32.
[958] McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 31.
[959] 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.
[960] Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., p. 581.
[961] Although SFG proposes using target prices, it recognises it is more common to use market prices. See SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, p. 8. McKenzie and Partington also

- If we use target prices in the DGM, the return on equity estimate will reflect analysts' views rather than the market's view on the return on equity. 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'.[962] However, McKenzie and Partington observed the objective is to obtain the market's implied return on equity.[963]

- 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.[964]

- Under the 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 over the next 12 months. That is, the target price represents the analysts' expectation of the 'correct' share price that it expects the market price will revert to.[965] 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 DGM equation does not hold if target prices are used.

SFG submitted there is value in using target prices rather than market prices. 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 also noted there are studies which report that analyst earnings expectations are optimistic.[966] Therefore, SFG considered that by using target prices, this could offset bias in analyst dividend forecasts. 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. 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 arbitrary. 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. Therefore, stakeholders should view our DGM estimate of the MRP as an upper bound.

C.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

---

observe it is common to use analysts' forecasts in DGMs. McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 26.

962 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 30.

963 McKenzie, Partington, *Report to the AER: The Dividend Growth Model (DGM)*, December, 2013.

964 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 30.

965 Fitzgerald, T., Gray, S., Hall, J., Jeyaraj, R. 2013, 'Unconstrained estimate of the equity risk premium', *Review of Accounting Studies*, Vol. 18., p. 570.

966 SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, p. 10.

return objective if they use estimation methods, financial models, market data and other evidence that meet this criteria.[967]

Since several service providers proposed SFG's construction of the DGM, we have assessed SFG's and our construction of the DGM against our criteria.[968] Table 3-46 shows our construction of the DGM has less limitations than SFG's construction.

Table 3-46 Assessing dividend growth models against AER 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 data	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 companies. This recognises it is implausible for dividends to grow larger than the economy in perpetuity.[969]	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 DGM.[970] It produces nonsensical results that 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 not widely used for this purpose in Australia, US regulators use them.	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— 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 available credible datasets	DGMs rely on market data. Therefore, if the methodology is transparent, it is possible to replicate results.	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 replicating the results.[971]
Where models of the return on equity and debt are used these are based on quantitative modelling that is sufficiently	DGMs are highly sensitive to assumptions.[972] This includes assumptions	Highly sensitive to our assumption on long term DPS growth. However, we are transparent about how we	Estimates long term DPS growth endogenously using market data. However, for a given price/earnings ratio, this

967 AER, *Rate of return guideline*, 17 December 2013, p. 6.

968 JGN, ActewAGL, the NSW DNSPs and TransGrid 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.

969 Lally, *The dividend growth model*, 4 March 2013, p. 13.

970 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.

971 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. McKenzie, Partington, *Report to the AER: The DGM*, 14 December 2013, p. 21.

972 McKenzie, Partington, *Equity market risk premium*, December 2011, p. 25; AER, Final decision: APA GasNet, March 2013, p. 101.

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.	about the length of transition. Results are sensitive to errors in analyst forecasts.	derive this assumption.	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, one could consider these criteria broad.[973] For instance, it allows 10% long term DPS growth, although this is implausible. SFG filters data by assuming growth in shares cannot be negative.[974] It also assumes price/earnings ratios cannot be negative.[975]
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 overly optimistic.[976]	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. SFG uses analyst forecasts over 6 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.	Readily incorporates changes in the market data, but may not track these changes accurately.[977] DGMs can generate volatile and conflicting results and are highly sensitive to interest rate changes.[978]	Averages estimates over 2 months. If the DGM produces accurate estimates, these will reflect changing market conditions.	Averages estimates over 6 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.

Source: AER analysis

C.3 Reasons for estimating the return on the market

We employ our construction of the DGM to inform our estimate of the MRP. This is consistent with the Guideline, where we considered DGM estimates of the MRP as a useful source of evidence.[979] 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. Specifically, 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

973 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.

974 This causes SFG to remove 20% of its data. We consider this unrealistic because share buybacks are widely used.

975 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.

976 McKenzie, Partington, *The DGM*, December 2013, p. 8.

977 McKenzie, Partington, *Report to the AER, Part A: Return on Equity*, October 2014, p. 31.

978 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.

979 AER, *Rate of return guideline*, December 2013, p. 13; AER, Explanatory statement to the rate of return guideline, December 2013, p. 96.

service providers.[980] There are difficulties with constructing credible datasets for implementing industry specific DGMs.[981] Also, there are too few Australian businesses to perform DGMs on individual businesses.[982]

- There are developed methods for estimating the growth rate of dividends in the Australian market.[983] 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.[984]

- There are important limitations of DGMs that limit our ability to 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, DGMs 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 the sanity test as the systematic risk of network businesses is less than the overall market.[985]

In contrast, some service providers submitted we should use empirical estimates from the DGM to estimate the allowed return on equity.[986] 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. We engaged McKenzie and Partington to provide advice on the DGM in light of service providers' recent regulatory proposals. McKenzie and Partington supported our decision not to use DGMs to directly estimate the return on equity.[987] They did support 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 the current time.[988]

In its report to several service providers, 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.[989] 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.

In SFG's analysis, there are only 99 return on equity estimates using analyst forecasts for the network businesses over the period 2002 to 2014.[990] 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 small sample of analyst forecasts available on Australian network businesses, it is difficult to derive a sound return on equity estimate for these businesses using DGMs.

---

980 AER, *Explanatory Statement to the rate of return guideline (appendices)*, December 2013, p. 15.
981 AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 77.
982 AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 119.
983 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.
984 AER *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 15.
985 AER, *Explanatory statement rate of return guideline (appendices)*, December 2013, p. 120-122.
986 TransGrid, *Regulatory Proposal*, May 2014, p12; ActewAGL, *Regulatory Proposal*, June 2014, p. 261; Jemena Gas Networks, *Regulatory Proposal Appendix 09.03 Return on equity proposal*, June 2014, p. 1. These service providers submit using the DGM set out in SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 11.
987 McKenzie, Partington, *Report to the AER Part A: Return on Equity*, October 2014, pp. 39–40.
988 McKenzie, Partington, *Report to the AER Part A: Return on Equity*, October 2014, pp. 26–41.
989 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, p. 2.
990 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2015, p. 58.

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:[991]

> 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 do not agree with SFG's position.

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. Similar to us, SFG used its DGM to directly estimate the return on the market as a whole. Specifically, SFG applied the following steps to estimate the market value return on equity for a benchmark efficient entity:

1. Estimate the return on equity for network businesses using the DGM for each of the analysts which provides 99 return on equity estimates. 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 99 ERPs from step one by the relevant MRP from the DGM.[992]

3. Take a simple average of the 99 risk premium ratios (determined in step two) to derive an average risk premium of 0.94.[993]

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 as a substitute for the equity beta in the SLCAPM. SFG has used its DGM to directly estimate the MRP and has inserted this into a version of the CAPM to estimate the market value return on equity for a network business. This is not too dissimilar to our approach. However, unlike our approach, there are several technical issues. These include:

- The method used to estimate equity beta is not econometrically sound. When applied correctly, beta is the covariance between the return on the market and the return on the business divided by the variance of the market. However, SFG determined its beta as the equity risk premium of a business divided by the MRP.

[991] McKenzie and Partington call the market value return on equity, the 'cost of equity'. McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 39.

[992] 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).

[993] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 20, p. 48.

- It estimated equity beta on a small dataset (only 99 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 beta estimation process because SFG's DGM gave businesses with more analyst coverage greater weight.

Further, the very high estimates from SFG's DGM, equating to an 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. This is also inconsistent with empirical estimates, as reported in Professor Olan Henry's 2014 report.[994]

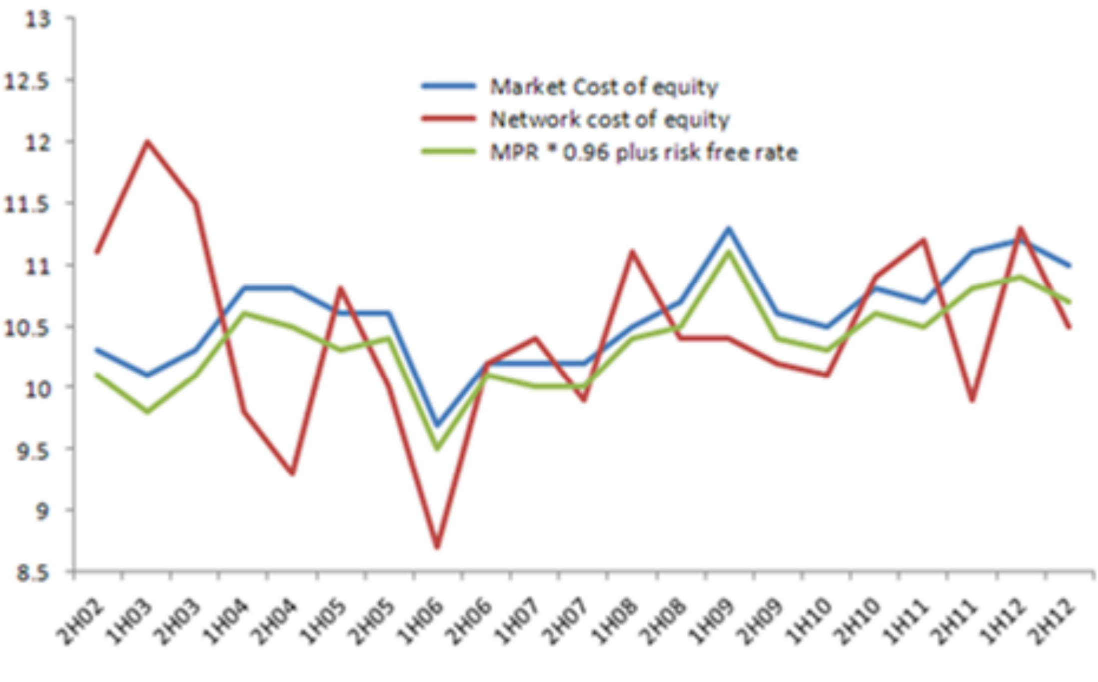
SFG submitted its DGM is more reliable and less volatile than our DGM. However, this perception of stability is subjective and we do not agree with it. Figure 3-18 illustrates this point by showing three time series:

- The market's return on equity determined by SFG's DGM (blue line)

- Network businesses' return on equity determined by multiplying the MRP from the SFG's DGM by 0.94 then adding the prevailing risk free rate (green line)

- Network businesses' return on equity determined by directly applying the SFG's DGM (red line)

Figure 3-18 Movements in SFG's dividend growth model



Source: SFG, AER analysis.

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 market value return on equity for network businesses using a hybrid CAPM/DGM are more stable (green line). SFG and service providers only proposed indirect estimates.

994 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.

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.

C.4 Prevailing estimates

For the two months up to end-September 2014, DGMs produce an estimate of the MRP within the range of 6.6 to 7.8 per cent. We construct this range from DGM estimates under different assumptions. Table 3-47 shows this.

Table 3-47 MRP estimates under dividend growth models, 0.6 theta (per cent)

Growth rate	Two stage model	Three stage model
4.0	6.6	7.0
4.6	7.2	7.4
5.1	7.7	7.8

Source: Bloomberg, AER analysis.

C.5 Sensitivities to prevailing estimates

Evidence before us indicates the MRP implied from DGMs is likely to show an upward bias in current market conditions.[995] 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 consider we need to be aware of. We also conduct some sensitivity analysis on our DGMs.

C.5.1 Sources of potential upwards bias in the current market

We consider our DGM may be overstating the MRP in the current market for the following reasons:

- The 'stickiness' of dividends can cause upwards bias in the implied return on equity from DGMs. This is because, in estimating the market value return on equity, DGMs use dividends as a proxy for free cash flow to equity (FCFE). However, dividends are a smoothed version of both FCFE and profits. This is because dividends follow slowly with changes in profits, and are particularly 'sticky' downwards.[996] Thus, if profits and FCFE 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.[997] This effect is exacerbated because firms can pay dividends that are higher than the FCFE by either borrowing or by issuing new shares. McKenzie and Partington referred to this as 'financing dividends'. The result, however, is that future dividends will be smaller or equivalently, growth will be lower.[998]
- 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

995 Lally, *The DGM*, 4 March 2013.
996 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 29–30.
997 Because dividends are 'stickier' downwards, this effect is smaller when FCFE and profits rise.
998 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 27–29.

its long term average.[999] As discussed in section C.2.3, we consider it useful to be aware of this potential bias. This is consistent with McKenzie and Partington's advice: [1000]

> 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

C.5.2 Sensitivity analysis

We also consider how sensitive our DGM is to the following factors:

- our long term dividend growth rate assumption
- the period we average estimates over
- biases in analyst forecasts

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 somewhat on the high side.[1001] 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.[1002] Table 3-48 sets out how these assumptions affect our estimates

Table 3-48 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)	7.7	7.8
4.6% growth (AER point estimate, Lally's estimate)	7.2	7.4
3.78% growth (McKenzie and Partington's estimate)	6.4	6.8

Source: Bloomberg, AER analysis.

We have based our DGM estimate on data over August and September 2014. However, McKenzie and Partington recently advised:[1003]

> Indeed, we would caution against relying on month by month, or even year by year, estimates from the DGM. Averaging measurement error over several 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 are not changing our approach set out in the Guideline. We will not average over several years because this will 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 3-49 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. Having regard to McKenzie and Partington's advice, we also consider a 12 month averaging period.

---

999 Lally, *The DGM*, 4 March 2013.

1000 McKenzie and Partington call the market value return on equity, the 'cost of equity'. McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 37.

1001 McKenzie, Partington, *Report to the AER, Part A: Return on equity* October 2014, p. 34; McKenzie, Partington, *The DGM*, December 2013, p. 24.

1002 The extreme values include the Lally/Barra growth estimate of 0.31% and the CEG estimate of 6.5%. See McKenzie, Partington, *The DGM*, December 2013, p. 15. Note McKenzie and Partington call the market value return on equity, the 'cost of equity'.

1003 McKenzie, Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 32.

Table 3-49 Averaging period sensitivities in the MRP, 0.6 theta (per cent)[1004]

Sensitivity	Two stage model	Three stage model
2 months to end September 2014	7.2	7.4
6 months to end September 2014	6.9	7.2
12 months to end September 2014	6.7	7.1

Source: Bloomberg, AER analysis.

McKenzie and Partington advised us that DGMs are often biased upwards because analysts tend to overestimate dividends.[1005] Although, we have no reason to think systematic underestimation across the market will occur, we have however done a sensitivity analysis. In table 3-50 we have adjusted forecast dividends per share 10 per cent downwards/upwards.

Table 3-50 DPS forecast sensitivities in the MRP, 0.6 theta (per cent) [1006]

Sensitivity	Two stage model	Three stage model
Forecast	7.2	7.4
Forecast + 10%	7.8	8.1
Forecast - 10%	6.6	6.8

Source: Bloomberg, AER analysis.

Table 3-51 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 3-51 Combined sensitivities in the MRP, 0.6 theta (per cent)

Sensitivity	Two stage model	Three stage model
Baseline	7.2	7.4
Low [b]	5.3	5.8
High [c]	8.3	8.5

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%.

[1004] Assuming we adopt our point estimate of the long term dividend growth (4.6%).
[1005] McKenzie, Partington, *Report to the AER: The DGM*, 14 December 2013, pp. 8–9.
[1006] Assuming we adopt our point estimate of the long term dividend growth (4.6%).

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).[1007] Because the SLCAPM works on the basis that investors can diversify away business–specific risk, only systematic risk is relevant for determining equity beta.[1008]

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.[1009]

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.[1010] 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 the service providers have raised in their proposals.[1011] 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 average firm. As discussed in the reasons for draft decision section (step two), 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.[1012] Our conceptual analysis indicates that the equity

---

1007 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.

1008 McKenzie and Partington, *Risk, asset pricing models and WACC*, June 2013, pp. 21–22

1009 NER, clauses 6.5.2(c) and 6A.6.2(c); NGR, rule 87(3).

1010 AER, *Rate of return guideline*, December 2013, p. 15.

1011 The service providers are TransGrid, TasNetworks, Directlink, Ausgrid, Endeavour Energy, Essential Energy, ActewAGL and Jemena Gas Networks.

1012 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 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. 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.[1013] 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.[1014] It is generally accepted that the benchmark efficient entity has lower business risk than the market average firm.[1015] We consider that business risk for the benchmark efficient entity will be very low for the following reasons:[1016]

- 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 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.[1017] 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.[1018] 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

---

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)

1013 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.

1014 We note business risk in this context is only systematic/market risk and does not include firm specific risk that can be diversified away.

1015 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, *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 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.

1016 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.

1017 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.

1018 McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 7, 14.

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).[1019]

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'.[1020] In their 2014 report for this draft decision, McKenzie and Partington reiterated this conclusion and cited a number of published academic articles to support their view.[1021] 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).

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.[1022] 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.[1023] They considered that, overall, increased financial leverage increases the financial and therefore systematic risk facing equity (i.e. 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 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).[1024] 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'.[1025]

Moreover, in its 2013 report, Frontier disaggregated financial risk (arising as a consequence of how the business's activities are funded) into five different subcategories.[1026] 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:[1027]

- low risk—default risk, financial counterparty risk, and illiquidity risk (for large networks)
- medium risk—refinancing risk
- medium to high risk—interest rate reset risk, and illiquidity risk (for small networks).

[1019] McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 6, 15.
[1020] McKenzie and Partington, *Estimation of equity beta*, April 2012, p. 14.
[1021] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 12.
[1022] McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 7, 10; SFG, *Equity beta*, May 2014, pp. 17–18; SFG, *Equity beta report prepared for APT Petroleum Pipelines Ltd*, October 2011, p. 11.
[1023] McKenzie and Partington, *Estimation of equity beta*, April 2012, pp. 7–13.
[1024] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 11.
[1025] McKenzie and Partington, *Report to the AER: Risk, asset pricing models and WACC*, June 2013, pp. 11–12.
[1026] This report included both systematic and non–systematic risk, although only the former is relevant for the estimation of equity beta.
[1027] Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 65.

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.[1028] Later in that report, Frontier acknowledges that our implementation of a trailing average approach would reduce interest rate reset risk.[1029]

In addition to the trailing average return on debt, there is an additional effect flowing from the new approach to the determination of the rate of return under the changed legislation. We expect our new approach to lead to a more stable return on equity over time. All else equal, this change should reduce the variability in returns to equity holders, and the more stable cash flows should reduce the default risk for the firm.[1030] Taken together, we consider the new approach to determining the rate of return should further reduce the benchmark efficient entity's exposure to financial risk.

On the basis of this information, 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 report supports this position, and 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 [1031]

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 fact, McKenzie and Partington conclude their 2012 conceptual assessment by stating:[1032]

> 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.

In their 2014 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.[1033]

1028 Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 64.
1029 Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 74.
1030 Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 24.
1031 McKenzie, Partington, *Report to the AER, Part A: Return on equity,* October 2014, pp. 12–13.
1032 McKenzie and Partington, *Estimation of equity beta*, April 2012, p. 15.
1033 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 11–12.

We have also received a number of stakeholder submissions that suggest regulated energy network service providers face very low levels of systematic risk. Origin Energy (Origin) considers an efficient benchmark cost of capital for these firms is more comparable to a corporate bond rate than that of a company like Origin.[1034] 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.[1035] The Energy Markets Reform Forum (EMRF) also submitted that:[1036]

> 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.

These submissions do not disaggregate systematic risk in order to consider separately the two offsetting factors of business risk and financial risk. We also note that our assessment of equity beta is to be representative of a benchmark efficient entity, which is not equivalent to any particular service provider. However, these submissions show that 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 report 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:[1037]

- It is an empirical (not conceptual) analysis, as McKenzie and Partington consider empirical literature to support their conclusions.
- It implies the effect of leverage on equity beta is weaker than 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.

In relation to SFG's view that our analysis is empirical and not conceptual, we consider this 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 report for this draft decision, 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.[1038]

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

1034 Origin, *Submission to NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 7.
1035 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.
1036 EMRF, *Submission to Jemena Gas Network's access arrangement proposal for 2015–20*, August 2014, p. 86.
1037 SFG, *Equity beta*, May 2014, p. 18.
1038 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 12.

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:

$$\beta_E = \beta_A \left(1 + \frac{D}{E}\right)$$

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 equity beta estimates because we acknowledge the uncertainty inherent in assuming a particular relationship between financial leverage and equity beta. In their 2014 report, McKenzie and Partington noted the above formula assumes a debt beta of zero, which is an incorrect assumption.[1039] 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:[1040]

> 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 be a precise representation of reality. However, it is important to note that the industry average gearing is very 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:[1041]

- 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).[1042] They did not de-lever and re-lever

---

1039 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 10.

1040 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.

1041 SFG, *Equity beta*, May 2014, pp. 19–20. 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.

1042 McKenzie and Partington, *Estimation of equity beta*, April 2012, p. 15.

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'.[1043]

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.[1044] In addition to mischaracterising McKenzie and Partington's analysis, we consider there are a number of problems with SFG's analysis:

- Its leverage adjusted (or re-levered) equity beta estimates are incorrect. The correctly adjusted estimates (to a gearing level of 60 per cent) are set out in Table 3-52, 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 it is the case that 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).

Table 3-52 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.[1045] 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

[1043] McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 11.
[1044] SFG, *Equity beta*, May 2014, p. 19.
[1045] CEG, *Equity beta from US companies*, June 2013, p. 20; AER, *Equity beta issues paper*, October 2013, p. 34.

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.[1046] 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 irrelevant because it is based on accounting data.[1047] We consider SFG has mischaracterised the evidence in the Schlueter and Sievers article. In their 2014 report, McKenzie and Partington made the following points:[1048]

- 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 does apply 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.[1049] 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.[1050] 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.[1051]

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 regulated energy network will be below 1.0. 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 the reasons for draft decision section

1046 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.

1047 SFG, *Equity beta*, May 2014, pp. 19–20.

1048 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 12.

1049 SFG, *Equity beta*, May 2014, pp. 20–21.

1050 Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, p. 65.

1051 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 41.

(step two), 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.[1052] Henry's 2014 report is one of a number of Australian empirical studies showing a consistent pattern of equity beta estimates that is robust to the use of different econometric techniques, 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 3-56). 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.[1053] 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'. 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 3-53 sets out the details of these nine firms. For its 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.[1054]

It is important to note that three of these firms are no longer trading. Another firm, AGL Energy Limited, has changed its operations such that it no longer closely represents a benchmark efficient

[1052] Henry, *Estimating β*, April 2009; Henry, *Estimating β: An update*, April 2014.

[1053] NER, clause 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.

[1054] 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) firm.[1055] 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).[1056]

Table 3-53 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 – present	Gas
GasNet (GAS)	December 2001 – November 2006	Gas
Hastings Diversified Utilities Fund (HDF)	December 2004– November 2012	Gas
Spark Infrastructure Group (SKI)	March 2007[1057] – present	Electricity Gas
SP AusNet (SPN)[1058]	December 2005 – present	Electricity Gas

Source: AER analysis; Bloomberg; AER, *Review of the WACC parameters: Final decision*, May 2009, p. 255.

While we consider the firms in Table 3-53 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.[1059]
- 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.[1060]
- Approximately 87 per cent of SP AusNet's (now AusNet Services) revenues are regulated, as at 30 May 2014.[1061]

1055 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.

1056 Henry, *Estimating β: An update*, April 2014, p. 12.

1057 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.

1058 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.

1059 APA Group, *Innovating today transforming tomorrow: APA Group annual report 2014*, p. 2.

1060 DUET Group, *Annual report 2014*, p. 5.

- 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.[1062]

- 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.[1063]

Generally, with the exception of APA Group and HDF, these non–regulated activities only constitute a small portion of the revenue earned by the firms in this comparator set. Therefore, when we consider the impact of these unregulated activities, we expect the net impact would be sufficiently minor such that our equity beta estimates for the comparators are reasonable.[1064] 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.[1065]

International comparators

We recognise there are only nine reasonable Australian comparators. However, 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.[1066] 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.[1067] This means the equity beta estimates from international

---

1061 SP AusNet, *Statutory annual report 2014*, June 2014, p. 25.

1062 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.

1063 GasNet, *Infrastructure for generations: GasNet Australia Group annual report 2005*, p. 29.

1064 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.

1065 Frontier Economics, *Assessing risk for regulated energy networks*, July 2013, pp. 15, 69, 77, 86.

1066 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.

1067 This is the case unless the equity betas are estimated using an international CAPM framework.

comparators are not a measurement of the firm's systematic risk relative to the Australian domestic market portfolio.[1068]

- 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.[1069] They engage in energy generation, wholesale and retail of energy, as well as other activities distinct from energy distribution and transmission. Some of the firms even engage in telecommunications, real estate development and manufacturing activities.[1070] 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.[1071]
- 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.[1072] 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, and our reasoning is discussed in detail below.

In its 2014 report 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.[1073]

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:[1074]

1068 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.

1069 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.

1070 CEG, *Information on equity beta from US companies*, June 2013, pp. 47–68.

1071 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.

1072 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.

1073 SFG, *Equity beta*, May 2014, p. 2.

1074 SFG, *Equity beta*, May 2014, pp. 31–34, 40.

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. Detailed reasoning for this can be found in the Guideline material.[1075] In its 2014 report, SFG has again submitted that we should include the sample of 56 US energy firms in our comparator set of Australian energy network firms.[1076] 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.[1077] However, this report compared Victoria's rural water sector with the energy sector, considering the rural water sector to be more vertically integrated. We consider this does 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.[1078]

SFG has also questioned our consideration that geography and weather may influence the equity beta of a similar business operating in different countries.[1079] 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 SFG's submission that climate and geography do differ within Australia. However, SFG has not recognised the broader issue we are considering. 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. We also consider international energy network firms are less reflective of the benchmark efficient entity than Australian energy network firms 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

1075 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.
1076 SFG, *Equity beta*, May 2014, p. 40.
1077 SFG, *Equity beta*, May 2014, p. 34.
1078 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.
1079 SFG, *Equity beta*, May 2014, p. 33.

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.[1080] 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.[1081] 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 in its 2013 report. It chooses the All Ordinaries accumulation index for the Australian market and the S&P 1500 for the US market.[1082] These stock market 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.[1083] 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:[1084]

  $$\beta_i = \frac{cov(r_i, r_m)}{var(r_m)}$$

  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.[1085] 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

1080 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 60.
1081 SFG, *Equity beta*, May 2014, pp. 33–34.
1082 SFG, *Regression-based estimates of risk parameters*, June 2013, pp. 9–10.
1083 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.
1084 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.
1085 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.

- 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 adds to these views. He considers comparing domestic equity betas with international equity betas is like comparing 'apples and oranges' because they are measured relative to different domestic markets.[1086] He stated:[1087]

> 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 considers 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.[1088] He considers 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.

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.[1089]

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.[1090] 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.[1091] 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.[1092] However, a larger dataset is not an end in itself. Decreasing the dispersion of estimates by increasing the size of the comparator set may not be helpful if that comparator set is less representative of what we are trying to estimate. In 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.[1093] The weekly returns for each firm are regressed

1086 Handley, *Advice on the return on equity*, October 2014, p. 23.
1087 Handley, *Advice on the return on equity*, October 2014, p. 23.
1088 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.
1089 Handley, *Advice on the return on equity*, October 2014, pp. 23–24.
1090 SFG, *Equity beta*, May 2014, pp. 13, 28–33.
1091 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.
1092 SFG, *Equity beta*, May 2014, p. 13.
1093 Henry, *Estimating β: An update*, April 2014.

against the weekly returns on the market over a period of time (the estimation period).[1094] 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.[1095] 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 have received submissions from the CCP and other stakeholders that do not support the inclusion of international energy firms in our domestic comparator set.[1096] 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.[1097] 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. They also questioned SFG's exclusive use of US firms, without having considered energy network firms from other countries.

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.[1098] 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 3-56).

Therefore, based on the available evidence and after consideration of SFG's submissions, we maintain our view from the Guideline.[1099] 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.

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

---

1094 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.

1095 Henry, *Estimating β: An update*, April 2014, pp. 17, 21.

1096 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.

1097 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.

1098 NER, clauses 6.5.2(c) and 6A.6.2(c); NGR, rule 87(3).

1099 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, p. 49. SFG also noted 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.

useful to examine evidence on many available international energy network firms, rather than only those based in the US.

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.[1100]

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').[1101]

The LAD estimation method reduces the influence of extreme observations (or potential data outliers) on its estimates.[1102] 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.[1103]

In its 2014 report for several service providers, SFG submitted that the LAD estimation method produces systematically downward biased equity beta estimates and should not be used.[1104] It also submitted LAD estimation is not used to estimate equity beta in academic research or in commercial practice. We do not consider 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, the authors considered the value–weighted average of equity beta estimates from their in–sample market index should equal 1.0.[1105] For the in–sample market index used by the 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 downward bias in equity beta estimates. We have the following concerns with SFG's view that LAD equity beta estimates are systematically downward biased:

1100 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.

1101 AER, *Review of the WACC parameters: Final decision*, May 2009, pp. 267–271.

1102 Greene, *Econometric analysis*, Pearson Education (Prentice Hall): Fifth edition, 2003, p. 448.

1103 ERA, *Rate of return guideline explanatory statement*, December 2013, p. 179.

1104 SFG, *Equity beta*, May 2014, p. 12.

1105 Brooks, Diamond, Gray, Hall, *Comparison of OLS and LAD regression techniques for estimating beta*, June 2013, pp. 9–10.

- SFG have not provided us with an econometric or conceptual reason 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.[1106] The authors do not justify a link between the particular market index they have used and more commonly used market indexes. They also do not determine whether these estimates are significantly different to 1.0 in a statistical sense. We 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'.[1107]

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:[1108]

- the longest period available (which Henry recommends in his 2014 report)
- the period after the 'technology bubble' and before the global financial crisis (GFC)[1109]
- the last five years of available data.

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.[1110] We rely more on equity beta estimates based on weekly return intervals, but monthly return intervals are considered as a robustness check.

1106 Brooks, Diamond, Gray, Hall, *Comparison of OLS and LAD regression techniques for estimating beta*, June 2013, p. 10.

1107 Henry, *Estimating β: an update*, April 2014, p. 62.

1108 Henry, *Estimating β: An update*, April 2014, pp. 11–12, 63. Henry uses data up to 28 June 2013.

1109 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.

1110 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.

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.[1111]

In its 2014 report for several service providers, 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).[1112] SFG referenced a report by CEG which was submitted to the ERA in 2013.[1113] 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.[1114] 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'.[1115]

We do not consider that SFG has provided an econometric or conceptual reason to expect that returns based on a particular day of the week will underestimate or overestimate equity beta for the benchmark efficient entity.[1116] 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.[1117] This is well 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.[1118] 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.[1119] 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

1111 Henry, *Estimating β: An update*, April 2014, pp. 9–10.

1112 SFG, *Equity beta*, May 2014, pp. 29–31.

1113 CEG, *Regression estimates of equity beta*, September 2013, pp. 25–27.

1114 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.

1115 SFG, *Regression based estimates of risk parameters for the benchmark firm*, June 2013, p. 5.

1116 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.

1117 See: SFG, *Equity beta*, May 2014, p. 30, figure 3. SFG's figure 3 shows the average equity beta estimates (over six Australian energy network firms) based on difference reference days for weekly and monthly return 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).

1118 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.

1119 SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, p. 15, footnote 28.

is, in theory, an infinite choice of return intervals to choose from, and one cannot account for all these possibilities.

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, as 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:[1120]

- 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
- The Centre for Research in Security Prices and Compustat merged database calculates monthly holding period returns from month end to month end.

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.[1121]

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:

1120 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.

1121 Figure 4 of SFG's 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, p. 31, figure 4; SFG, *Equity beta*, May 2014, p. 30; CEG, *AER equity beta issues paper: International comparators*, appendix A, October 2013, pp. 41–45.

- 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 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

Our task is to estimate a value for equity beta that is representative of the benchmark efficient entity. Ideally we would use firms that exactly reflect characteristics of the benchmark efficient entity when conducting our regression analysis to estimate the equity beta. However, few firms fully reflect this benchmark in practice. We consider the nine Australian energy network firms in our comparator set are reasonable comparators to the benchmark efficient entity.

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 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.[1122] We do not consider there is evidence in Henry's 2014 report that indicates a 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.[1123] 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.

1122 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.*

1123 The most common value in a sample is referred to as the mode.

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:[1124]

- 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.[1125] 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.

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.[1126] In the 2009 WACC review we stated:[1127]

> 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.

For this draft decision, SFG has again proposed we apply a Vasicek adjustment to our equity beta estimates.[1128] 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.[1129]

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.[1130] 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.[1131] This

---

1124 Henry, *Estimating β: An update*, April 2014, pp. 34–36.
1125 Henry, *Estimating β: An update*, April 2014, p. 52.
1126 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.
1127 AER, *Review of WACC parameters: Final decision*, May 2009, p. 243.
1128 SFG, *Equity beta*, May 2014, p. 11.
1129 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.
1130 Vasicek, *A note on using cross-sectional information in bayesian estimation of security betas*, Journal of Finance 28(5), December 1973, p. 1233.
1131 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.

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 the US market, which has a mean of 1.0.[1132] 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.[1133] 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:[1134]

> 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.

Even if we put aside 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.[1135] 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.
- 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.
- The reasoning behind the separation of stocks into low, medium and high beta portfolios is unclear. The authors noted that this mitigates the impact that company and industry specific

1132 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. 1233.

1133 SFG, *Equity beta*, May 2014, p. 10.

1134 Vasicek, *A note on using cross-sectional information in bayesian estimation of security betas*, Journal of Finance 28(5), December 1973, p. 1237.

1135 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.

events will have on the relative returns of each portfolio. However, they have not made it clear why this is necessary when the SLCAPM measures systematic risk only.

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.[1136]

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.[1137] 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)
- do not apply a Blume or Vasicek adjustment.[1138]

We consider the equity beta estimates presented in Henry's empirical analysis support a range of 0.4 to 0.7. Table 3-54 and Table 3-55 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, raw market gearing level) estimates range from 0.48 to 0.50.[1139]
- 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.[1140]

Table 3-54 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)]

[1136] SFG, *Regression-based estimates of risk parameters*, June 2013, p. 6.
[1137] Henry, *Estimating β: An update*, April 2014, p. 9.
[1138] Henry does not apply a Blume or Vasicek adjustment of any of his estimates, as specified in our terms of reference.
[1139] 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.
[1140] These estimates are not presented but can be found at: Henry, *Estimating β: An update*, April 2014, pp. 90–93.

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 3-55 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 boom and GFC)	0.49	0.52	0.55	0.53	0.45
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'.[1141] The results are as follows:[1142]

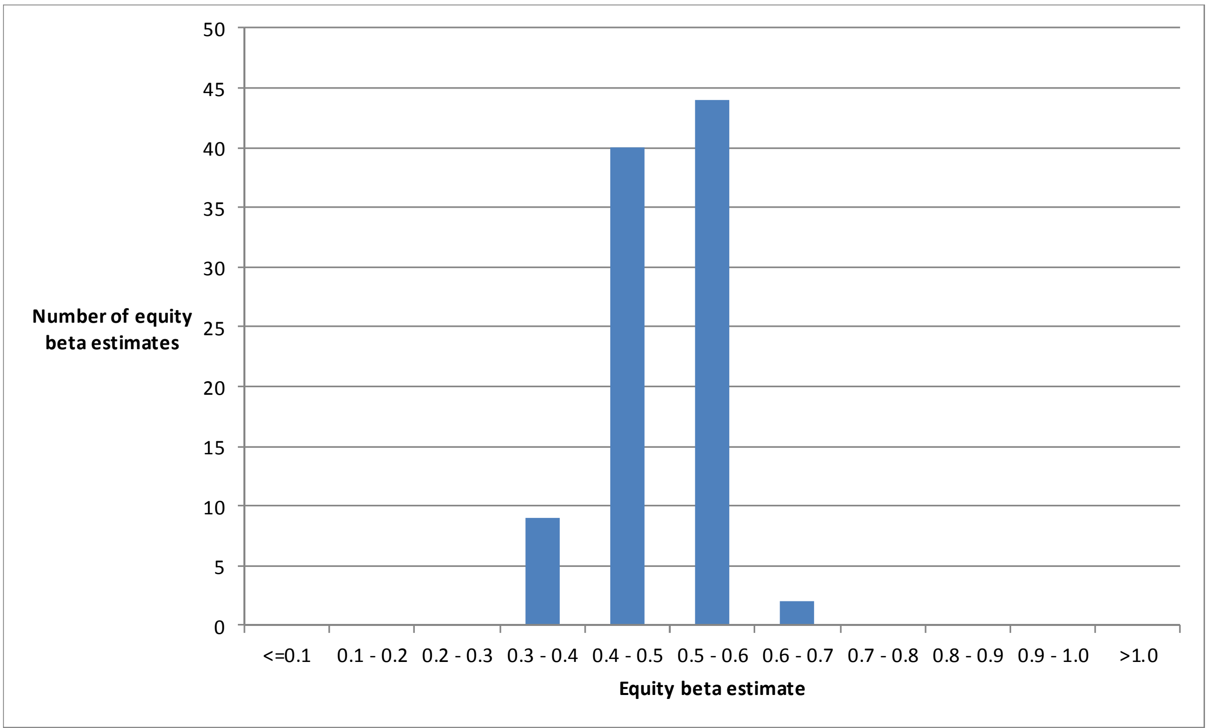
- the re-levered LAD estimates range from 0.38 to 0.58 and the raw LAD estimates range from 0.31 to 0.60.[1143]
- the OLS estimates using monthly return intervals range from 0.37 to 0.58.[1144]

1141 Henry, *Estimating β: An update*, April 2014, p. 62.
1142 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.
1143 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.
1144 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 of equity beta 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.

Henry also performed various robustness and sensitivity tests on the equity beta estimates. These included the Dimson adjustment for thin trading, as well as recursive estimates and the Hansen test for parameter stability and sensitivity. Henry concluded that there is little to no evidence of thin trading across all regression permutations and 'no overwhelming issue with instability'.[1145] 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 3-19.

Figure 3-19 Number of equity beta estimates from Henry's 2014 report (average of individual firm estimates and fixed weight portfolio estimates)



Source: AER analysis; Henry, *Estimating β: An update*, April 2014.
Note: This figure contains all averages of individual firm estimates and fixed weight portfolio estimates presented in Henry's 2014 report (95 estimates in total). This includes OLS and LAD estimates, raw and re-levered estimates, weekly and monthly return intervals and all estimation periods.

In its 2014 report for several service providers, SFG expressed concerns regarding the reliability of equity beta estimates based on a small comparator set of Australian energy network firms.[1146] We

1145 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.

1146 SFG, *Equity beta*, May 2014, pp. 2–3.

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.[1147]

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.[1148] 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':[1149]

- 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 have also received submissions from the CCP, which suggested that most of the equity beta estimates presented in Henry's report are clustered around a range of 0.3 to 0.5.[1150]

SFG and the CCP used individual firm estimates to support their views.[1151] We consider the most relevant empirical estimates are averages of individual firm estimates and fixed weight portfolio estimates, and these estimates range from 0.4 to 0.7 under almost every regression permutation considered, including:[1152]

- 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 the average of individual estimates for Australian and US energy firms.[1153]

In regards to the consistency on our equity beta estimates over time, the re-levered OLS estimates presented in Henry's 2009 report range from 0.44 to 0.71.[1154] 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

1147 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.

1148 SFG, *Equity beta*, May 2014, p. 27, figure 2.

1149 SFG, *Equity beta*, May 2014, p. 3.

1150 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.

1151 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.

1152 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.

1153 SFG, *Equity beta*, May 2014, p. 41; SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, p. 13.

1154 This range includes averages of individual firm estimates and fixed weight portfolio estimates. See: Henry, *Estimating β*, April 2009.

2013 Rate of return guideline based on its own studies.[1155] In fact, Table 3-56 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 (excluding time varying portfolios and Vasicek/Blume adjustments) are considered, then the equity beta estimates presented in these studies fall within the 0.4 to 0.7 range.[1156] 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.[1157] 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 also display significant variability. They range from 0.49 to 1.51, according to SFG's analysis.[1158] 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.[1159]

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 3-56. 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 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 3-56 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	2009–2014[(c)]	0.42–0.64			weekly/monthly return intervals, multiple estimation periods, OLS regressions,

[1155] ERA, *Rate of return guideline explanatory statement*, December 2013, p. 171.

[1156] See Table 3-56. 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).

[1157] SFG, *Equity beta*, May 2014, p. 40.

[1158] SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, p. 19.

[1159] This includes all individual firm estimates (OLS, LAD, weekly returns, monthly returns, all estimation periods). Henry, *Estimating β: An update*, April 2014, p. 27.

2014					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 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.[1160]

(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.

1160 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.

D.3 International empirical estimates

In the reasons for draft decision section (step two), 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.[1161] The additional studies we consider in this draft decision present equity beta estimates that range from 0.45 to 1.14.[1162] These studies are discussed below:

- 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.[1163] 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.[1164] The resulting OLS equity beta estimates are as follows:[1165]
  - 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.[1166]
- The Damodaran equity beta estimates for US industry groups have been updated. However, Damodaran has changed his industry classifications since 2013.[1167] 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 2013 year–end). The resulting OLS equity beta estimates for the utilities (general) industry are as follows:[1168]
  - raw:

1161 AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 64–67.

1162 The re-levered estimates presented have been calculated using the Brealey-Myers formula set out in our empirical analysis section (see subsection D.2.3). We note that our de-levering and re-levering process may have more of an impact on these international empirical estimates because the average industry gearing may not be similar to our benchmark gearing level of 60 per cent.

1163 CEG, *Information on equity beta from US companies*, June 2013, p. 7.

1164 SFG, *Regression-based estimates of risk parameters*, June 2013, p. 6.

1165 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 draft decision. The raw average equity beta estimate without a Vasicek adjustment is 0.67.

1166 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.

1167 '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 January 2014, viewed 6 November 2014, see link: http://people.stern.nyu.edu/adamodar/.

1168 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/.

        - 0.56 as at January 2014
    - re-levered to 60 per cent gearing:[1169]
        - 0.83 as at January 2014.
- 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 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:[1170]
    - 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 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.[1171] 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.[1172]
- 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.[1173] PwC's June 2014 report presents the following raw equity beta estimates for New Zealand energy network firms as at 31 December 2013:[1174]
    - 0.6 for the average of the 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. The resulting average equity beta estimates are:[1175]
    - raw:
        - 0.53 for the average of European individual firm estimates
        - 0.67 for the average of US individual firm estimates
        - 0.57 for the average of European and US individual firm estimates
    - re-levered to 60 per cent gearing:[1176]

1169 We have de-levered and re-levered the raw equity beta estimates from Damodaran's data.

1170 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.

1171 The interim decision applied the 2011 generic cost of capital decision as a placeholder for 2014. See: Alberta Utilities Commission, *2013 Generic Cost of Capital*, December 2011, pp. 1–2.

1172 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.

1173 See: http://www.pwc.co.nz/appreciating-value/pwc-wacc-formula/

1174 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.

1175 The Brattle Group, *The WACC for the Dutch TSOs, DSOs, water companies and the Dutch pilotage organisation*, March 2013, p. 16.

- 0.65 for the average of European individual firm estimates
- 1.14 for the average of US individual firm estimates
- 0.79 for the average of European and US individual firm estimates.

In its 2014 report, 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.[1177] 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 (in the reasons for draft decision section), 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 have 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.[1178] 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 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.

We note the pattern of international results is not consistent and there are inherent uncertainties when relating foreign estimates to Australian conditions. 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.

D.4 The theory of the Black CAPM

In the reasons for draft decision section (step two), 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.[1179]

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

[1176] We have de-levered and re-levered the raw equity beta estimates from the data in Brattle Group's report.
[1177] SFG, *Equity beta*, May 2014, p. 32. SFG also consider we should include US energy firms in the comparator set for our empirical analysis.
[1178] 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.
[1179] AER, *Explanatory statement to the rate of return guideline (appendices)*, December 2013, pp. 68–73.

SLCAPM.[1180] 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.2.3.

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 in the reasons for draft decision section).

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 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.[1181] 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.[1182]

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.

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, and that the uplift applied was insufficient.[1183] They also submitted that we applied this uplift to correct for potential 'low beta bias' inherent in the SLCAPM. 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

---

1180 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.

1181 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, pp. 24–25.

1182 McKenzie and Partington, *Report to the AER, Part A: Return on equity*, October 2014, p. 24.

1183 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: Report for Jemena Gas Networks, ActewAGL distribution, Ergon and Transend*, May 2014, pp. 92–95 (SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014). 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'.

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. This is discussed in detail in section D.5.3.

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.[1184]

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:[1185]

> the majority of evidence presented in this report, across all estimators, firms and portfolios, and all sample periods considered,

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.[1186] As demonstrated in

---

[1184] AGL, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 19; NCOSS, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 2; Energy Australia, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 2; Ethnic Communities Council of NSW, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 2; PIAC, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 19; Total Environment Centre, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 14; ACT Civil and Administrative Tribunal, *Submission to ActewAGL's regulatory proposal for 2014–19*, August 2014, p. 2; AGL, *Submission to Jemena Gas Network's access arrangement proposal for 2015–20*, August 2014, p. 8; Lumo Energy, *Submission to Jemena Gas Network's access arrangement proposal for 2015–20*, August 2014, p. 2; PIAC, *Submission to Jemena Gas Network's access arrangement proposal for 2015–20*, August 2014, p. 5.

[1185] Henry, *Estimating β: An update*, April 2014, p. 63.

[1186] 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

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.[1187] 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 DGM estimates of relative risk.[1188] CEG and SFG consider the equity beta range proposed in the Guideline:[1189]

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.[1190]

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 the following section.

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 0.45 to 1.14. The pattern of international results is not consistent and there are inherent uncertainties when relating foreign estimates to Australian conditions.

[1187] CEG, *WACC estimates*, May 2014, pp. 6–7.
[1188] CEG, *WACC estimates*, May 2014, pp. 6–7; SFG, *Equity beta*, May 2014, p. 41; SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013.
[1189] SFG, *Equity beta*, May 2014, pp. 25–27; CEG, *WACC estimates*, May 2014, 6–11.
[1190] SFG, *Regression-based estimates of risk parameters for the benchmark firm*, June 2013, pp. 13–15.

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. However, we do not consider the theory underlying the Black CAPM warrants a specific uplift or adjustment to the equity beta point estimate.[1191] The theory underlying the Black CAPM is qualitative in nature, and we are satisfied that this information is 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 achieving 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. The AEMC and stakeholder submissions to the 2012 rule change process accepted these views.[1192]

After taking these considerations into account, we adopt an equity beta point estimate of 0.7 for this draft 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 very 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.[1193] 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 that our equity beta point estimate was set too high.[1194] For example, the EMRF submitted that:[1195]

1191 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 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.

1192 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.

1193 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.

1194 CCP, *Submission to TransGrid's revenue proposal for 2014–19*, August 2014, p. 7. EMRF, *Submission to TransGrid's revenue proposal for 2014–19*, July 2014, p. 32. EUAA, *Submission to TransGrid's revenue proposal for 2014–19*, August 2014. Norske Skog Paper Mills, *Submission to TransGrid's revenue proposal for 2014–19*, August 2014, p. 8. Origin, *Submission to TransGrid's revenue proposal for 2014–19*, August 2014, pp. 1–2; CCP, *Submission to TasNetworks' revenue proposal for 2014–19*, September 2014, p. 8; Bell Bay Aluminium, *Submission to TasNetworks' revenue proposal for 2014–19*, August 2014, p. 3; EUAA, *Submission to TasNetworks' revenue proposal for 2014–19*, August 2014, p. 8; MEU, *Submission to TasNetworks' revenue proposal for 2014–19*, August 2014, pp. 33–34; Nyrstar, *Submission to TasNetworks' revenue proposal for 2014–19*, August 2014, p. 2; TSBC, *Submission to TasNetworks' revenue proposal for 2014–19*, August 2014, p. 42; CCP, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, pp. 15–17; EMRF, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, July 2014, pp. 35–36; Origin, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 7; PIAC, *Submission to the NSW distribution network service providers' regulatory proposals for 2014–19*, August 2014, p. 80; UnitingCare, *Submission to the NSW*

> Consumers have noted that the market parameters (equity beta and market risk premium) have been set by the AER on the "high side" of what the market indicates are the realistic values for these, thereby providing a benefit to the networks…The EMRF considers that the work carried out by Prof Henry is more relevant and contemporaneous than the assessments provided by the DBs and CEG and should lead the AER to use a lower equity beta than 0.7.

Conversely, many service providers have submitted that our equity beta point estimate was set too low in the Guideline. They consider our approach dilutes or eliminates the impact of relevant information, and does not sufficiently correct for various possible biases in the SLCAPM.[1196]

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. 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 do not consider the 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.2.1). Our equity beta point estimate provides a balanced outcome, given the submissions by stakeholders and services providers. Figure 3-20 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 and RPP.[1197]

---

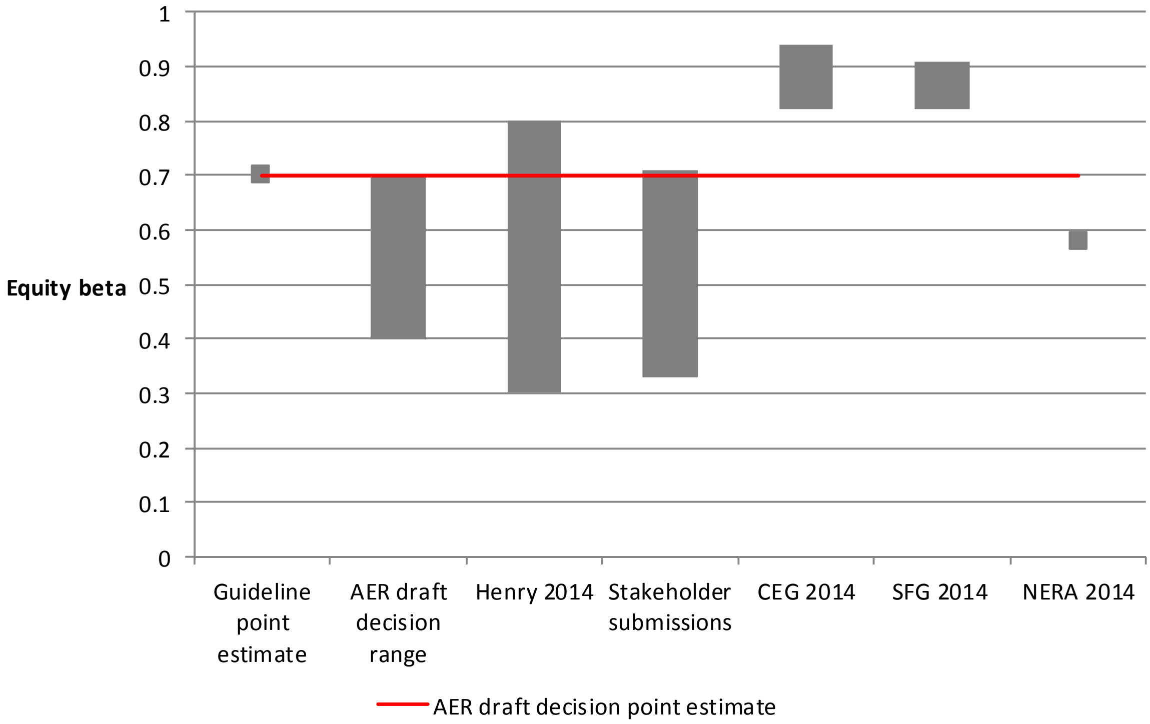
distribution network service providers' regulatory proposals for 2014–19, September 2014, p. 20; UnitingCare, *Submission to ActewAGL's regulatory proposal for 2014–19*, September 2014, p. 20; EMRF, *Submission to Jemena Gas Networks' access arrangement proposal for 2015–20*, August 2014, pp. 71, 75–76.

1195 EMRF, *Submission to TransGrid's revenue proposal for 2014–19*, July 2014, pp. 27, 32.

1196 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.

1197 NER, clauses 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 3-20 Comparison of the AER's equity beta range and point estimate with Henry's 2014 report and submissions



Source: AER analysis.[1198]

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 Norske Skog Paper Mills' submission that we should adopt the median estimate presented in Henry's 2014 report. The upper bound is based on Origin's submission that we should not increase the equity beta above 0.71. The CEG 2014 range lower bound is equal to the SFG 2014 lower bound and its upper bound is based on DGM estimates. The SFG 2014 range lower bound is based on SFG's regression analysis of Australian and US firms and the upper bound is based on SFG's composite equity beta estimate proposed under its alternative 'foundation model' approach. The NERA 2014 point estimate is based on an equity beta of 0.58, which NERA used for its preferred specification of the SLCAPM.

D.5.3 Potential for bias in the SLCAPM and consideration of other information

Many service providers have submitted that the empirical performance of the SLCAPM is poor and affected by various possible biases.[1199] Many have also submitted that the equity beta estimates from our empirical analysis are unreliable.[1200] These service providers have proposed various approaches to correct for these perceived limitations. 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.

1198 Based on our draft decision and the following reports: AER, *Rate of return guideline*, December 2013, p. 15; Henry, *Estimating β: An update*, April 2014, p. 63; Norske Skog Paper Mills, *Submission to TransGrid's revenue proposal for 2014–19*, August 2014, p. 8; Origin, *Submission to ActewAGL's regulatory proposal for 2014–19*, August 2014, p. 4; CEG, *WACC estimates: A report for the NSW DNSPs*, May 2014, p. 7; NERA, *Return on capital of a regulated electricity network*, May 2014, p. 79. SFG proposes 0.82 in SFG, *Equity beta*, May 2014, p. 41 and 0.91 in SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 11.

1199 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; CEG, WACC estimates, p. 11.

1200 See: SFG, *Equity beta*, May 2014, pp. 2–3; CEG, *WACC estimates*, May 2014, p. 7.

JGN proposed two alternative approaches to estimating the return on equity, which result in the same overall return on equity estimate.[1201] The first approach is a multiple model approach, and JGN's consultant, SFG, determined an equity beta of 0.82 for the SLCAPM (based on a comparator set of Australian and US energy firms).[1202] The second approach is an alternative specification of our foundation model approach. Under this approach SFG constructed a 'composite equity beta estimate' of 0.91, which incorporated information from the Black CAPM, Fama French three factor model (FFM) and its own construction of the DGM.[1203] SFG submitted that:[1204]

> In general, if the foundation model approach is to be used, the equity beta estimate must be adjusted to reflect the relevant evidence from all relevant financial models.

Therefore, SFG's key issues with our approach to selecting the equity beta point estimate (and range) can be summarised as follows:[1205]

- It is based on 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 the range adopted by the AER.
- It does not sufficiently account for 'low beta bias' in the SLCAPM, and does not account for DGM evidence and evidence that the SLCAPM a value premium (FFM).[1206] To account for this, the AER should adopt a multiple model approach or apply SFG's composite equity beta estimate for the foundation model approach (a weighted average of the implied equity beta from all models).

On SFG's first point, 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 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 of the available information.

On SFG's second point, we do not make a specific adjustment to our equity beta point estimate to correct for any 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 appendix A.2.1).[1207] 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.

1201 JGN, *Access arrangement information, Appendix 9.3: Return on equity proposal*, June 2014, pp. 32–33, 40–41.

1202 SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 85.

1203 SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 96.

1204 SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, p. 94.

1205 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.

1206 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.

1207 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.2.3). 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.2.2).

Moreover, SFG proposed we consider empirical evidence from the Black CAPM, FFM and its own construction of the DGM.[1208] It submitted that 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). 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 steps one and two of our foundation model approach. 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 as it does not meet most of the criteria.

SFG's DGM based estimates of equity beta are derived by estimating the relative risk ratio of Australian energy network firms to the market.[1209] 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 SFG's DGM construction, and these are discussed in sections C.2.7 and C.3 of appendix C.

1208 SFG, *The required return on equity for regulated gas and electricity network businesses*, May 2014, pp. 94–96.
1209 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, May 2014, pp. 56–57.

E Other information – return on equity

In the reasons for draft decision section of our draft decision we noted the other information included in our Guideline or submitted by stakeholders as relevant material. Two sources of relevant material are the prevailing return on debt and return on equity estimates from other market practitioners. We determined that these materials would inform our overall return on equity estimate. Further information in support of the reasons for draft decision is below.

E.1 Return on debt: response to TransGrid's proposal

In the reasons for draft decision section, in our discussion of step four, we compare our foundation model estimate of the return on equity to the prevailing return on debt for our benchmark entity.

TransGrid, through a report prepared by NERA, submitted that a comparison to the return on debt indicates that the equity risk premium proposed in our rate of return guideline was too low.[1210] NERA submitted that:

- The credit spread on BBB corporate bonds post-GFC has increased an average of 315 basis points from pre-GFC levels and equity risk premiums can be expected to increase by a commensurate, if not larger, amount.[1211]

- The US Federal Energy Regulatory Commission (FERC) removes from its range of reasonable estimates any return on equity estimates that are within 100 basis points of the average yield on public utility bonds over a six month period. NERA submits that, based on the average yield on BBB rated corporate bonds for 20 days ending 31 March 2014, the US FERC would remove about 60 per cent of the equity risk premium range proposed in our rate of return guideline.[1212]

The relationship between debt and equity returns, however, is more complex than any simple heuristic implies. Given the inconclusive evidence on the size and strength of any relationship between debt and equity premiums, we do not feel that it is at this stage necessary or appropriate to implement a rule of thumb about movements in premiums or their spread. In relation to NERA's report, we do note that the following:

- Debt premiums appear on average to be higher in the post-GFC period relative to the long-term, pre-GFC historical average. However, the prevailing debt premium is lower than the post-GFC average and closer to the long-term, pre-GFC historical average. Debt premiums have declined 101 basis points since NERA's report was submitted by TransGrid. Updating the debt and equity returns means that the US FERC policy applied in this case would remove about 31 per cent of our return on equity range. Our preliminary risk premium point estimate from the foundation model is 200 basis points above the debt risk premium.

- Debt returns would be lower if adjusted from promised, pre-tax returns to expected, post-tax returns.

[1210] NERA, *Return on capital of a regulated electricity network*, May 2014, pp. 114–118.
[1211] NERA, *Return on capital of a regulated electricity network*, May 2014, p. 116.
[1212] NERA, *Return on capital of a regulated electricity network*, May 2014, p. 117. The equity risk premium range proposed in our rate of return guideline was 2.00 to 5.25, based on a market risk premium range of 5.0 to 7.5 per cent and an equity beta range of 0.4 to 0.7.

- The US FERC compared equity premiums to the premium of public utility bonds over the risk free rate, while our benchmark return on debt is based on all BBB corporate bonds. It is likely that public utility bonds would be lower than the average yield for all BBB corporate bonds.[1213]

NERA submitted that the difference between debt and equity risk premiums for regulated businesses does not need to be adjusted for the difference between promised and expected returns because regulatory returns for both debt and equity are promised returns. NERA note that, in addition to the return on debt, actual (realised) return on equity may vary from the determined allowance in the event of default.[1214]

The setting of regulatory allowances up front does not make our estimated return on equity a promised return. In the event of default, differences between allowed and realised return on equity would not reflect differences between expected and promised returns, but rather differences between expected and realised returns. Realised returns will deviate from expected returns in any instance simply because the realised return reflects the event that has been realised, while expected returns will reflect a probability-weighted average of all possible events.[1215] An expected return on debt must be less than the yield to maturity to the extent that there is any expected default. We consider that BBB-rated corporate debt is likely to include some default expectation.

NERA also submits that default risk, as a difference between promised and expected returns to debt, cannot explain changes to debt risk premium because the premium is estimated by reference to bonds of a set credit rating. NERA submits that an increase in default risk should result in a downgrade in credit rating. In that case, any increase in the observed yield on BBB rated corporate bonds should be attributable to debt investors requiring increased compensation for risk, rather than an increase in default risk.[1216]

We consider that a sufficiently large change in default risk is likely to result in a change in credit rating, but we also consider there is likely to be room for some movement in the default risk premium within a rating band. We note that Standard & Poor's credit ratings reflect only the probability of default, while Moody's ratings reflect the cost of default. Differences in the cost of default for a given probability of default can be expected to result in differences in bond yields. Further, the timing of changes in risks and changes in credit ratings may not align—credit ratings may to some extent be a lagging indicator of default risk.

NERA submitted that the issue of comparing return on debt and return on equity on a consistent tax-treatment basis was unnecessarily distracting as the analysis is not from the business' perspective but from the perspective of the providers of debt and equity finance.[1217] We agree that the investor's perspective is preferred, but we remain of the view that an accurate comparison demands a consistent treatment of tax (from any perspective), though we note that this issue does not affect the results of our analysis.

E.2 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 the NSP (that this draft decision applies). Other market

---

[1213] For the reasons outlined in step two in reasons for draft decision section.

[1214] NERA, *Return on capital of a regulated electricity network*, May 2014, pp. 114–115.

[1215] For example: if the return in the event of default is 0 per cent and the return absent default is 8 per cent, and the probability of default is 10 per cent, then the expected return = 0% * 0.1 + 8% * 0.9 = 7.2%. Although the expected return is 7.2 per cent, this return will not be realised in the event of a default (in that case a 0 per cent return will be realised).

[1216] NERA, *Return on capital of a regulated electricity network*, May 2014, p. 115.

[1217] NERA, *Return on capital of a regulated electricity network*, May 2014, p. 115.

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 draft 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 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.[1218] We do not consider that TransGrid's proposed role of valuation reports promotes the rate of return objective given the limitations mentioned above. ActewAGL and Jemena Gas Networks proposed using broker and valuation reports to inform estimates of the market risk premium.[1219] We note that consideration of the market risk premium estimates from broker and valuation reports is included in our consideration of the overall return on equity estimates from these reports (since the market risk premium is one component of the overall return on equity). Detailed assessment of the proposals by TransGrid, ActewAGL, and Jemena Gas Networks is also outlined below.

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 CAPM-based estimate of return on equity to account for:[1220]

> 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

1218 TransGrid, *Revenue Proposal*, 2014/15–2018/19, p. 189.
1219 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*, 2 June 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.
1220 Grant Thornton, *Polymetals Mining Ltd: Independent expert report and financial services guide*, 31 May 2013, p. 101.

> 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 do not consider that these type of risks are systematic risks and therefore are not consistent with our application of the CAPM in the foundation model.

To best achieve the rate of return objective, our allowed rate of return should reflect only non-diversifiable (systematic) risks. The return on equity estimates from valuation reports may then not best achieve the rate of return objective.

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.

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 1.37 and 1.50 times Envestra's RAB.[1221]

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 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 best achieves the 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. This is contrasted to determining a regulatory rate of return where we set the return on equity only for the length of the regulatory period (typically five years). Where expectations of the overall return on equity or of individual CAPM parameters over the next five years differs from expectations over a longer timeframe, the estimates from broker and valuation reports may be biased and not achieve the rate of return objective.

For example, Deloitte in its report for RHG Ltd stated that it increased its preliminary CAPM-based estimate of return on equity because:[1222]

> 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.

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 the relevant timeframe (perpetuity).

1221 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.]. 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.

1222 Deloitte, *RHG Limited: Independent Expert's Report and Financial Services Guide*, 5 November 2013, p. 62.

It is noted that 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 assumptions made about the foundation model estimate and the 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 CAPM 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,[1223] and all the recent broker reports,[1224] 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, 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, and therefore on what extent the estimates already reflect the value of imputation credits. For example, Grant Samuel in its report for Aquilla Resources that its estimate of market risk premium "makes no explicit allowance for the impact of Australia's dividend imputation system"[1225] 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".[1226] Grant Samuel refers to Australian studies of the market risk premium that both include and exclude the impact of dividend imputation.[1227] 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.[1228]

As noted by McKenzie and Partington, the full set of assumptions should be laid out before appropriate adjustments can be fully understood.[1229] We consider that there is insufficient information to support any precise adjustment for dividend imputation, reducing the comparability of broker and valuation estimates.

1223 See Table 3-20.
1224 Equity markets research reports by JP Morgan, Macquarie, and Credit Suisse distributed to clients between 15 July 2014 and 30 September 2014.
1225 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.
1226 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.
1227 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.
1228 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.
1229 McKenzie & Partington, *Report to the AER: Part A Return on Equity*, 1 October 2014, p. 38.

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.

For example, Grant Samuel in its report for DUET Group stated that it came to its beta estimate after:[1230]

> 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, would be to effectively double-count the importance provided to the material in a way that is potentially misleading.

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 that 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).

We 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.[1231]
- Grant Samuel's uplift to its initial CAPM 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. 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

[1230] 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.

[1231] Grant Samuel's independent expert report for Envestra is dated 3 March 2014 but the CAPM parameters estimated by Grant Samuel appear to have been estimated on 28 February 2014. As shown in the reasons for draft decision section, the risk free rate has decreased significantly in recent months.

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). Conversely, our return on equity estimate should reflect expectations over only our 5 year regulatory period after which our return on equity will be re-estimated consistent with the prevailing risk free rate at that time. Given our purpose, it is less clear that Grant Samuel's uplifts and final return on equity estimate best achieves the rate of return objective.

- Grant Samuel's valuation range would have resulted in a transaction multiple of between about 1.4 and 1.6 times Envestra's RAB.[1232] 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 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.[1233] TransGrid increased Grant Samuel's return on equity estimates to account for dividend imputation.[1234] 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.[1235]

ActewAGL's and JGN's proposed role for valuation reports

ActewAGL and Jemena Gas Networks proposals use independent valuation (expert) reports to inform estimates of MRP.[1236] In its report prepared for ActewAGL, Jemena Gas Networks, and TasNetworks; SFG states:[1237]

> 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 CAPM 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.

1232 Grant Samuel valued Envestra at between $1,994.4 million and $2,373.4 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.]

1233 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.

1234 TransGrid, *Revenue Proposal*, 2014/15–2018/19, p. 190.

1235 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.

1236 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*, 2 June 2014, p. 252].

1237 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.

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 in its report for ActewAGL and Jemena Gas Networks:[1238]

> we note that certain assumptions must be made when seeking to extract an appropriate MRP estimate from an independent expert report (in particular, the extent to which various uplift factors should be incorporated into the MRP estimate).

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 draft decision section).

1238 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.

F Relevant material – return on equity

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. 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,	Given some reliance in informing the MRP (directional

implied volatility)	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
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

We note that a vast amount of material was submitted by NSPs in support of their proposals. Table 3-58 shows an estimate of the material submitted.

Table 3-58 Estimate of material submitted by the NSPs

Type of material	Number of pages

Total material cited in regulatory proposals	9,395
Material cited in regulatory proposals and previously made available to the AER	5,139
New material cited in regulatory proposals	4,256

Source: AER analysis.
Notes: Current regulatory proposals are for the following eight NSPs: ActewAGL, Ausgrid, Directlink, Endeavour Energy, Essential Energy, Jemena Gas Networks, TasNetworks (accepted the Guideline), and TransGrid.

G Return on debt

In attachment 3 we set out our position on the return on debt and key reasons for that position. We also summarised JGN's proposed position on the return on debt and responded to the key issues raised in JGN's proposal.

In this appendix, we set out further supporting material for our position on the return on debt. We also respond to JGN's proposed return on debt and key issues raised by other stakeholders in more detail.

This appendix addresses the following return on debt issues:

- the NPV principle
- the form of transitional arrangements
- the formula to estimate the trailing average portfolio approach with transitional arrangements
- several issues associated with the benchmark credit rating—the calculation of the industry median and adopting a common credit rating benchmark across electricity and gas service providers
- several issues associated with the choice of data series—the formula for automatic application, adjustments to the published series, and assessment of the third party data series against the rate of return criteria in the rate of return guideline (the Guideline)

G.1 The NPV Principle

In section 3.4.2 of attachment 3, we briefly discuss the importance of the NPV principle in economic regulation. This section explores this concept in more detail.

In attachment 3, we also outlined how this principle supports our decision on a transition to the trailing average approach. Specifically, we explained that our transition applied to the debt risk premium is consistent with the NPV principle. We based our consideration on Lally's analysis of the NPV value of a regulated business's net cash flows.[1239]

In the following paragraphs we explain how the NPV principle is a fundamental principle of economic regulation. We are satisfied that any regulatory approach that promotes the NPV principle would be consistent with the rules.

Lally defined the NPV principle as follows:

> …the revenues resulting from regulatory policy, net of opex and taxes, should have a present value equal to the initial investment (efficient costs) in the regulated assets.[1240]

Under the rules, we must use the building block model to calculate the maximum allowed revenue in revenue determinations.[1241] The adoption of the building block model dates back to 2004, when the ACCC released its statement of principles for the regulation of electricity transmission revenues (SRP). The ACCC stated:[1242]

1239 Lally, M., *Transitional arrangements for the cost of debt*, November 2014, pp.22–25.
1240 Lally, M., *Transitional arrangements for the cost of debt*, November 2014, p.22.
1241 NER, r.6A.5 and r.6.4; NGR, r.76
1242 ACCC, *Statement of principles for the regulation of electricity transmission revenues*, 2004, p.5.

> The building block model consists of two equations which are known as the revenue equation and the asset base roll forward equation. These two equations are used to determine an allowed stream of revenues for each TNSP for as long as it remains regulated. Ignoring any incentive rewards or penalties, these equations together ensure that the present value of the allowed revenue stream is equal to the present value of the expenditure stream of the regulated firm.

In 2006, in its rule determination for the electricity transmission regime (chapter 6A of the NER), the AEMC adopted the ACCC's SRP. The AEMC stated:[1243]

> In line with the views expressed in many submissions, the Revenue Rule draws heavily on existing practice and experience. The principal components of the Statement of Regulatory Principles (SRP), developed by the Australian Competition and Consumer Commission (ACCC) and adopted by the Australian Energy Regulator (AER), have been reflected in the Revenue Rule, including:
>
> - the adoption of a revenue cap approach;
>
> - a post-tax revenue model using the building blocks methodology; and
>
> - an incentive regime to promote and balance expenditure efficiency and service reliability.

In 2006, the Standing Committee of Officials of the Ministerial Council on Energy (MCE) stated:[1244]

> SCO is mindful that the AEMC engaged in extensive consultation on developing the detail of the transmission revenue rules and was working from a base of consistent regulation developed by the Australian Competition and Consumer Commission under their Statement of Regulatory Principles for Electricity Transmission Revenue Regulation. The approach of officials in the initial NGR is not intended to limit future development of the NGR through the AEMC rule change process. Officials have taken high level guidance from the AEMC's approach, where possible, to increase consistency and commonality, reflecting the common revenue and pricing principles that guide the electricity and gas regimes.

In 2007, the MCE stated the following:

> To achieve the MCE's objective of consistency where appropriate, the Exposure Draft of distribution revenue Rules largely builds on the AEMC's approach to economic regulation of electricity transmission.[1245]
>
> …a common element of regulation between prescribed transmission services (which applies a revenue cap as the price control method) and standard control distribution services is determining a revenue requirement using a building block approach.[1246]

G.2 Form of the transitional arrangements

We adopt transitional arrangements applied to the total return on debt. In making this decision, we also assessed different potential transition paths. For the reasons set out in attachment 3, we are satisfied that a transition, as set out in the Guideline and applied to the total return on debt, would contribute to the achievement of the allowed rate of return objective. In particular, such a transition:

- Minimises the potential mismatch between the allowed return on debt and the actual return on debt of the benchmark efficient entity, as it transitions its financing practices.
- Avoids potential windfall gains or losses to service providers or consumers from changing the regulatory regime
- Avoids practical problems with the use of historical data

[1243] AEMC, *National Electricity Amendment (Economic Regulation of Transmission Services) Rule*, 2006,pp.iv-v and p.34.
[1244] MCE, Legislative Package: Initial National Gas Rules, 2006, p.4.
[1245] MCE, *Changes to the National Electricity Rules to establish a national regulatory framework for the economic regulation of electricity distribution – Explanatory Material*, 2007, p.5.
[1246] MCE, *Changes to the National Electricity Rules to establish a national regulatory framework for the economic regulation of electricity distribution – Explanatory Material*, 2007, p.13.

- Maintains the same average price level while decreasing price volatility over time
- Reduces the potential for opportunistic behaviour from stakeholders
- Further, adopting the same transitional arrangements for all service providers is consistent with our adoption of a single benchmark efficient entity definition.

Some of these reasons are applicable to the risk free rate component of the return on debt, some to the debt risk premium component, and some to both components. These reasons are explained in attachment 3.

In reaching our view, we also assessed a number of alternative transitional arrangements that could potentially be applied.

We have considered three options for the form of the transition path:[1247]

- Option 1: Lally alternative transition path[1248]—during the first year of the new regime, the base rate component of the return on debt would be weighted 90 per cent at the prevailing floating rate during that year and 10 per cent at the prevailing risk free rate. In the second year, the base rate component would be weighted 80 per cent at the prevailing floating rate in the second year, 10 per cent at the prevailing risk free rate rate in the second year, and 10 per cent at the risk free rate from the first year, and so forth for the remaining years. Under this transition path the benchmark efficient entity would not need to engage in another further interest rate swaps at the start of the new regime in order to match the base component of its actual return on debt with the allowed return on debt. While this option would eliminate the mismatch between the actual and allowed return on debt, Lally advised that it would require adoption of a different transition path for the debt risk premium. Accordingly, adopting different transition paths for the base rate component and the debt risk premium component adds complexity.
- Option 2: AER/QTC transition path—under this approach, the trailing average commences based on the prevailing rate in the first year, and this is progressively updated as set out in the Guideline. Lally estimated that this option would reduce to close to zero the mismatch between the actual and allowed return on debt of the benchmark efficient entity.[1249] It also has the advantage that it can be applied to the debt risk premium component as well as the base rate component, avoiding the additional complexity of option 1.[1250] This transition path was also subject to extensive consultation during the Guideline development process. Most submissions supported this type of approach to the commencement of the trailing average.
- Option 3: Another alternative transition path—this option is the same as option 2 for the first access arrangement period under the new regime, but differs for the second access arrangement period. For the second access arrangement period, the return on debt on the portion of the debt

[1247] We note the transition path proposed by Regulatory Economic Unit (REU) (formerly Regulatory Development) (2013, pp.45-49) also could apply to the risk free rate. The REU proposed to apply it to the total cost of debt. This transition path assumed service providers have organised their debt issuance to reflect the on the day approach; that is, debt perfectly aligned with the regulatory cycle, and therefore all debt maturing at the end of each regulatory cycle. It assumed a benchmark debt term of 5 years. Lally (March 2014) observed that this assumption may only be true for the risk free rate because service providers pay a trailing average DRP. For more details, see: Regulatory Economic Unit (formerly Regulatory Development), *Estimating the cost of debt: A possible way forward*, April 2013, pp.45–49; and Lally, M., The trailing average cost of debt, 19 March, pp.32–35.

[1248] Lally, M., *Transitional arrangements for the cost of debt*, November 2014, pp.8–12.

[1249] Lally estimated the residual mismatch to 0.5 per cent per year. For more details, see: Lally, M., *Transitional arrangements for the cost of debt*, November 2014, pp.8–12.

[1250] Lally estimated the residual mismatch to 0.5 per cent per year. For more details, see: Lally, M., *Transitional arrangements for the cost of debt*, November 2014, pp.4-5.

portfolio that is yet to be updated is reset to the prevailing rate at the start of the second access arrangement period. The key difference between option 2 and option 3 is that the latter places less weight on the prevailing return on debt from the start of the first access arrangement period. The return on debt in the first access arrangement period would be identical under options 2 and 3. In essence, option 3 more closely replicates a continuation of the on-the-day approach for existing debt, where the allowed return on debt was reset at each access arrangement period. However, Lally compared option 2 and option 3 under various interest rate scenarios and concluded:[1251]

> So, despite the fact that this alternative transitional regime has greater conceptual appeal, its results are less satisfactory, and therefore the AER's proposed scheme is superior.

We consider each of these approaches has strengths and weaknesses. However, we maintain the AER/QTC's transition path adopted in the Guideline because:

- It maintains the transition path set out in the Guideline, which was subject to extensive consultation with stakeholders and had the support of most stakeholders.
- It is simpler—under the AER/QTC's proposed approach, a consistent transition path can apply to both the risk free rate and debt risk premium.[1252] However, under option 1, a different transition path would be required for the base rate component and debt risk premium.[1253]
- Lally supported option 2 after acknowledging that his alternative option 1 transition path would not be materially different to option 2, in terms of the reduction in mismatch between actual and allowed returns on debt, and would add complexity applying a different transition path to the debt risk premium.[1254]

Option 2 was subject to extensive consultation with stakeholders during the Guideline process and was supported by most stakeholders. Option 2 is our preferred option. However, we note that options 1 and 3 were not considered during the Guideline process. Accordingly, we are also interested in stakeholder views on options 1 and 3. However, we would not depart from the transition path in the Guideline without good reasons.

G.3 Trailing average portfolio approach and transition formula

This section sets out our draft decision formula to estimate the trailing average portfolio approach, including transitional arrangements.

G.3.1 Transitional arrangements

Below we specify the allowed return on debt formulae for each year of the 10 year transition path. In each formula:

$_{a}R_{a+10}$ corresponds to the estimated return on debt that was entered into in year a and matures in year a+10; and

1251 Lally, M., *Transitional arrangements for the cost of debt*, November 2014, p.12.
1252 We note this is also the case under the AER/QTC approach.
1253 Lally, M.,*Transitional arrangements for the cost of debt*, November 2014, pp.3–4.
1254 Lally, M., *Transitional arrangements for the cost of debt*, November 2014, p.4.

$_{b}kd_{b+1}$ refers to the allowed return on debt for regulatory year b+1. We will compute the estimates of $_{a}R_{a+10}$ in accordance with the specified estimation method and represent simple averages of the estimates for each business day within the corresponding averaging period.

In the first regulatory year of the transitional period (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:

$$_{5}kd_{6} \;= 0.5 \cdot \; _{0}R_{10} + 0.1 \cdot \; _{1}R_{11} + 0.1 \cdot \; _{2}R_{12} + 0.1 \cdot \; _{3}R_{13} + 0.1 \cdot \; _{4}R_{14} + 0.1 \cdot \; _{5}R_{15}$$

$$_{6}kd_{7} \;= 0.4 \cdot \; _{0}R_{10} + 0.1 \cdot \; _{1}R_{11} + 0.1 \cdot \; _{2}R_{12} + 0.1 \cdot \; _{3}R_{13} + 0.1 \cdot \; _{4}R_{14} + 0.1 \cdot \; _{5}R_{15} + 0.1 \cdot \; _{6}R_{16}$$

$$_{7}kd_{8} \;= 0.3 \cdot \; _{0}R_{10} + 0.1 \cdot \; _{1}R_{11} + 0.1 \cdot \; _{2}R_{12} + 0.1 \cdot \; _{3}R_{13} + 0.1 \cdot \; _{4}R_{14} + 0.1 \cdot \; _{5}R_{15} + 0.1 \cdot \; _{6}R_{16} + 0.1 \cdot \; _{7}R_{17}$$

$$_{8}kd_{9} \;= 0.2 \cdot \; _{0}R_{10} + 0.1 \cdot \; _{1}R_{11} + 0.1 \cdot \; _{2}R_{12} + 0.1 \cdot \; _{3}R_{13} + 0.1 \cdot \; _{4}R_{14} + 0.1 \cdot \; _{5}R_{15} + 0.1 \cdot \; _{6}R_{16} + 0.1 \cdot \; _{7}R_{17} + 0.1 \cdot \; _{8}R_{18}$$

$$_{9}kd_{10} = 0.1 \cdot \; _{0}R_{10} + 0.1 \cdot \; _{1}R_{11} + 0.1 \cdot \; _{2}R_{12} + 0.1 \cdot \; _{3}R_{13} + 0.1 \cdot \; _{4}R_{14} + 0.1 \cdot \; _{5}R_{15} + 0.1 \cdot \; _{6}R_{16} + 0.1 \cdot \; _{7}R_{17} + 0.1 \cdot \; _{8}R_{18} + 0.1 \cdot \; _{9}R_{19}$$

G.3.2 Trailing average portfolio approach

We will estimate the allowed return on debt using a trailing average portfolio approach following the completion of a transitional arrangement period. We will apply the following:

- a trailing average portfolio approach with the length of the trailing average to be 10 years
- equal weights to be applied to all the elements of the trailing average
- the trailing average to be automatically updated every regulatory year within the access arrangement period.

In particular, we will determine the allowed return on debt for each regulatory year within a access arrangement period in accordance with the following formula:

$$ {}_{x}kd_{x+1} = \frac{1}{10} \cdot \sum_{t=1}^{10} {}_{x-10+t}R_{x+t} $$

where:

${}_{x}kd_{x+1}$ refers to the allowed return on debt for regulatory year x+1

${}_{x-10+t}R_{x+t}$ refers to the estimated rate of return on debt that was entered into in year (x-10+t) and matures in year (x+t) (in the formula above all debt has a ten year term); and

weights of 1/10 apply to each element of the trailing average.

Estimates of ${}_{x-10+t}R_{x+t}$ represent simple averages of the estimates for each business day within the averaging period in year (x-10+t). We will obtain each daily estimate within the averaging period from an independent third party data provider in accordance with the estimation procedure specified.

G.4 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 detail 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 (TransGrid, Directlink and TasNetworks) proposed a BBB+ credit rating. Other service providers (Ausgrid, ActewAGL, Endeavour Energy, Essential Energy and JGN) proposed a BBB credit rating.[1255] Whereas, consumer representatives generally submitted a credit rating of BBB+ would overcompensate network service providers.[1256] We are not satisfied these submissions provide reason to depart from our BBB+ benchmark credit rating.

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)

1255 Ausgrid, *Regulatory proposal*, May 2014, p. 70; Endeavour Energy, *Regulatory proposal*, May 2014, pp. 104–105; Essential Energy, *Regulatory proposal*, May 2014, p. 91; ActewAGL, *Regulatory proposal*, 2 June 2014 (resubmitted 10 July 2014), p. 255; JGN, *2015–20 Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, pp. 9–10.

1256 EMRF submit TransGrid and the NSW DNSPs (Ausgrid, Endeavour Energy and Essential Energy) are overcompensated by the AER's use of a BBB+ credit rating because their owner acquires debt at AAA rates. Similarly, Norske Skog submitted TransGrid's rate of return should reflect its access to a AAA credit rating. See 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.

- 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)

G.4.1 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.[1257] This is made up of the following businesses:

- APT Pipelines Ltd
- ATCO Gas Australian LP
- DBNGP Trust
- DUET Group
- ElectraNet Pty Ltd
- Energy Partnership (Gas) Pty Ltd
- 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 3-59 sets out these median credit ratings.

Table 3-59 Median credit rating for AER sample over different time periods

Time period	Median credit rating	Time period	Median credit rating
Current year (2014)	BBB+	Last 6 years	BBB

1257 That is, Ergon Energy Corp Ltd.

Last 2 years	BBB+	Last 7 years	BBB/BBB+
Last 3 years	BBB+	Last 8 years	BBB+
Last 4 years	BBB/BBB+	Last 9 years	BBB+
Last 5 years	BBB	Last 10 years	BBB+

Source: Bloomberg (Standard and Poor's), AER analysis.

While this analysis shows some support for a credit rating of BBB, we consider it shows stronger support for a credit rating of BBB+. Table 3-59 shows the majority of estimation periods over the last 10 years result in a credit rating of BBB+.

G.4.2 Current industry median

JGN and CEG (commissioned by Ausgrid, ActewAGL, Endeavour Energy and Essential Energy) reported credit rating data.[1258] Our calculations of median credit ratings reconcile with CEG's and JGN's calculations until 2013. In 2013, we calculate a median credit rating of BBB+ instead of BBB calculated by CEG and JGN. Since the median credit rating was BBB at the start of 2013, this indicates CEG's and JGN's estimates do not include all data up to the 2013 calendar year end.

Over the several years up until when CEG's and JGN's reported data ends, there had been a range of credit rating downgrades that caused 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+.[1259]

We consider all 2013 data and 2014 data up until September 2014. The median credit rating for 2013 is BBB+. To date, the median credit rating in 2014 is also BBB+. Table 3-60 sets out the median credit ratings across our comparator set since the 2003 calendar year end. These results differ from CEG's and JGN's because at the end of the 2013 calendar year:

- ATCO Gas Australian LP had a credit rating of A-, rather than BBB.
- DUET Group was non-rated (NR) rather than having a credit rating of BBB-.
- Powercor Australia LLC has a credit rating of BBB+, rather than A-.
- AusNet Services had a credit rating of A-, rather than BBB+.
- SGSP Australia Assets Pty Ltd had a credit rating of BBB+, rather than BBB.

Table 3-60 Median credit rating of energy network service providers over time

Issuer	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014 a

1258 JGN, *2015–20 Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, pp. 9–10; 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.

1259 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.

APT Pipelines Ltd	NR	NR	NR	NR	NR	NR	BBB	BBB	BBB	BBB	BBB	BBB
ATCO Gas Australian LP	NR	NR	NR	NR	NR	NR	NR	NR	BBB	BBB	A-	A-
DBNGP Trust	NR	BBB	BBB	BBB	BBB	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-
DUET Group	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	NR	NR
ElectraNet Pty Ltd	BBB+	BBB+	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-	BBB-	BBB-
Envestra Ltd	BBB	BBB	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB	BBB+
ETSA Utilities	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-
Powercor Australia LLC	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-	BBB+	BBB+
AusNet Servicesc	A	A	A	A	A	A-	A-	A-	A-	A-	A-	A-
SGSP Australia Assets Pty Ltd b	NR	NR	NR	NR	NR	A-	A-	A-	A-	A-	BBB+	BBB+
The CitiPower Trust	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-
United Energy Distribution Pty Ltd	BBB	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Median (year)	BBB/ BBB+	BBB+	BBB+	BBB+	BBB+	BBB+ /A-	BBB	BBB	BBB	BBB	BBB+	BBB+

Source: Bloomberg (Standard and Poor's), AER analysis.
Note: a) Measured up to September 2014. We measure all other years as calendar year ends.

b) Formerly SPI (Australia) Assets Pty Ltd.
c) Formerly SP AusNet Group.

G.4.3 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.

ActewAGL and JGN did not propose taking the median credit rating over a particular period. However, ActewAGL noted there had been a sustained drop in the median credit rating since 2009.[1260] Also, JGN indicated that considering median credit ratings over a longer time period, similar to our approach in the Guideline, is not appropriate.[1261] Specifically, JGN observed:[1262]

> 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:

- There had been a range of downgrades in credit ratings 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+.[1263]
- In this draft 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.
- 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.[1264]
- Ausgrid, Endeavour Energy, Essential Energy proposed applying a credit rating of BBB from 2009 onwards. These service providers considered:[1265]

> it is appropriate to hold this benchmark credit rating constant for the five years of this regulatory period - an approach which is consistent with the view that the benchmark only changes gradually. However, an alternative approach would be to calculate the median credit rating of the AER sample in the middle of each new averaging period (calendar year)

We propose to apply a benchmark credit rating of BBB+ for this access arrangement period. However, since independent data service providers publish data for a broad BBB band, we note this

---

1260 ActewAGL, p. 279; CEG, *Memorandum: Factors relevant to estimating a trailing average cost of debt*, 24 May 2014, p. 1.
1261 See AER, *Explanatory statement to the rate of return guideline*, 17 December 2013, p. 156.
1262 JGN, *2015-20 Access Arrangement Information Appendix 9.10 Return on debt proposal*, 30 June 2014, p. 8.
1263 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.
1264 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.
1265 Ausgrid, *Regulatory proposal*, May 2014, p. 71; Endeavour Energy, *Regulatory proposal*, May 2014, p. 105; Essential Energy, *Regulatory proposal*, May 2014, p. 92.

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+.[1266]

G.4.4 Exclusions to the 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 one government owned business.[1267] In its reports for Ausgrid, ActewAGL, Endeavour Energy and Essential Energy, CEG submitted we should exclude some of these businesses from our comparator set.[1268] We do not agree with this position.

CEG suggested Citipower, Powercor and ETSA should arguably constitute one observation because they are all part of the same corporate group.[1269] We do not agree with this position. It appears that if a credit rating agency rates a particular issuer (whether it is a parent or a subsidiary); the rating applies to the creditworthiness of that particular issuer.[1270] Parent companies can issue debt, but subsidiaries can also issue their own debt.[1271] As evidence of this, these businesses can have different separate credit ratings. For instance, Powercor Australia LLC currently has a different credit rating (BBB+) to the Citipower Trust and ETSA Utilities (A-).

Even if we were to treat firms in the same corporate group as one observation, we do not consider this would affect the credit rating. For instance, Lally noted:[1272]

> This argument for using only one observation across these three firms is reasonable. However, the same argument would apply to DUET, Energy Partnership (wholly owned by DUET) and DBNGP (80% owned by DUET).

We do not agree with CEG's approach of deleting observations. However, if we were to apply this rationale, we would apply it as Lally has.[1273] That is, we would also count the subsidiaries of DUET Group as one observation.[1274] Table 3-61.

Table 3-61 shows that adopting this approach would have no impact on the median credit rating. In industry median in Table 3-60 is the same as the industry median in Table 3-61.

Table 3-61 Median credit rating of energy network service providers over time (excluding firms within the same corporate group)

Issuer	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014 a
APT Pipelines Ltd	NR	NR	NR	NR	NR	NR	BBB	BBB	BBB	BBB	BBB	BBB

1266 Lally, *Implementation issues for the cost of debt*, November 2014, p. 4.
1267 That is, Ergon Energy Corp Ltd.
1268 CEG, *Attachment 7.01: WACC estimates, a report for the NSW DNSPs*, May 2014, p. 65; CEG, *Memorandum: Factors relevant to estimating a trailing average cost of debt*, 24 May 2014, pp. 14–15.
1269 These businesses are 51% owned by Cheung Kong Infrastructure Holdings Ltd.
1270 A credit rating is a credit rating agency's assessment of the creditworthiness of an issuer of financial securities. See Viney, C., 'McGrath's financial institutions instruments and markets, McGraw–Hill Australia, Ed 4, 2003, p. 17.
1271 For example, Standard and Poor's has rated DUET Group as an issuer of debt in the past (although DUET Group is currently non-rated). Standard and Poor's has also rated DBNGP Trust, Energy Partnership (Gas) and United Energy Distribution as separate issuers of debt, although these are subsidiaries of DUET Group.
1272 Lally, *Implementation issues for the cost of debt*, November 2014, p. 29.
1273 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 28–31.
1274 DUET Group, *Annual report 2014*, p. 110.

ATCO Gas Australian LP	NR	NR	NR	NR	NR	NR	NR	NR	BBB	BBB	A-	A-
DUET Group	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	NR	NR
ElectraNet Pty Ltd	BBB+	BBB+	BBB+	BBB+	BBB+	BBB+	BBB	BBB	BBB	BBB	BBB	BBB
Envestra Ltd	BBB	BBB	BBB	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB-	BBB	BBB+
AusNet Services	A	A	A	A	A	A-	A-	A-	A-	A-	A-	A-
SGSP Australia Assets Pty Ltd	NR	NR	NR	NR	NR	A-	A-	A-	A-	A-	BBB+	BBB+
The CitiPower Trust	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-	A-
United Energy Distribution Pty Ltd	BBB	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Median (year)	BBB/ BBB+	BBB+	BBB+	BBB+	BBB+	BBB+ /A-	BBB	BBB	BBB	BBB	BBB+	BBB+

Source: Bloomberg (Standard and Poor's), AER analysis.
Note: a) Measured up to September 2014. We measure all other years as calendar year ends.

CEG suggested removing AusNet Services and SGSP Australia Assets Pty Ltd from the comparator set (or reducing their credit ratings).[1275] This is because they both had credit rating support from their Singaporean Government ownership, and credit rating agencies put them on negative watch when they diluted this ownership in 2013.[1276] We do not agree with this position and note the following:

- We do not see why we should delete firms from our sample when they are on negative watch (or positive watch, for that matter). If CEG maintains this position, we consider it should provide more detailed reasoning for its position.
- Even if we were to accept this reasoning, we note some time has passed since this dilution. Therefore, credit ratings should already incorporate any relevant information arising from this event. For instance, since this change in ownership, Standard and Poor's has revised SGSP

[1275] CEG refers to SPI (Australia) Assets and SP AusNet Group. However, these companies are now SGSP Australia Assets Pty Ltd and AusNet Services respectively.
[1276] CEG, *Attachment 7.01: WACC estimates, a report for the NSW DNSPs*, May 2014, p. 65.

Australia Assets Pty Ltd's credit rating down from A- to BBB, and back up to BBB+.[1277] Credit ratings agencies have maintained AusNet Services' A- credit rating; which is a target of AusNet Services' Board.[1278]

Overall, we note that there are a range of possible reasons for excluding firms from the comparator set that could be put forward. These potential reasons include excluding firms within the same corporate group, excluding firms with parent ownership, and excluding firms with non-regulated activities. The merits of each of these can be debated, and we assess the first two reasons (proposed by CEG) above. If each of these exclusion criteria were applied it would likely leave a sample that is too small to draw meaningful conclusions on. In such a case, we would like find there were insufficient reasons to depart from the previous benchmark, which is BBB+.

Accordingly, our preferred approach is to include the full sample of privately owned energy network service providers, while recognising the strengths and limitations of this approach. However, whether applying all or none of the potential exclusion criteria, we would likely maintain a BBB+ benchmark credit rating.

G.4.5 Private credit ratings and government firms

Some consumer groups submitted applying a benchmark credit rating of BBB+ is generous to service providers that acquire debt from their parents with higher credit ratings. These proposals appear to primarily relate to government owned service providers. We do not agree with these proposals.

While the Energy Markets Reform Forum (EMRF) supported applying the Guideline, it also submitted that a BBB+ credit rating provides a significant benefit to TransGrid, Ausgrid, Endeavour Energy and Essential Energy.[1279] This is because these service providers acquire credit from their owner which acquires debt at AAA rates. Norske Skog submitted TransGrid's rate of return should reflect its access to a AAA credit rating.[1280]

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.[1281] After careful analysis, we defined a benchmark efficient entity as, 'a pure play, regulated energy network business operating within Australia'.[1282] 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 almost identical between government owned and private service providers.[1283]
- 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

[1277] SGSP (Australia) Assets Pty Ltd, *Financial report for the year ended 31 March 2014*, p. 2

[1278] SP AusNet, *Business review 2014*, p. 106.

[1279] EMRF, *AER review of NSW electricity transmission 2014*, July 2014, p. 28; EMRF, *AER review of NSW electricity distribution 2014*, July 2014, p. 33.

[1280] Norske Skog Albury Mill, *NSW Electricity Transmission Revenue Reset: Response to TransGrid's Application*, p. 4.

[1281] 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).

[1282] See AER, *Explanatory statement to the rate of return guideline*, 17 December 2014, pp. 30–45.

[1283] AER, *Explanatory statement to the rate of return guideline*, 17 December 2013, p. 44.

advantage of government finance. The risk premium on government finance would, in principle, be no different to that of private investors.[1284]

- The relevant issue is whether government ownership alters the risks of investing in and operating energy networks. The AEMC has noted:[1285]

> 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.

G.4.6 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.[1286] In particular, lenders are willing to lend at lower rates because they value the stability of utility earnings.

While we consider there is merit in this submission, 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 (cross reference). 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 important factors in determining the return on debt. For instance, the ERA has found, 'there is no better alternative approach, which is as simple, independent, and transparent as the Standard and Poor's method, in assessing credit risk'.[1287]

- 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.[1288]

- To a limited extent, we take factors other than the benchmark credit rating and term to maturity into account. When we assess the third party curves before us, we assess the features of their respective sample selections. For instance, we assess the benefits and limitations of optionality, currency of issue and whether cures include financial, non-financial bonds, secured or unsecured bonds. However, in practice this has a limited impact because we have two third party curves to choose from—both of which have benefits and limitations regarding these additional features.

1284 Klein, M., 'The risk premium for evaluating public projects', *Oxford Review of Economic Policy*, Vol. 13, No. 4, pp. 29–42.
1285 AEMC, *Rule determination: Economic Regulation of Network Service Providers*, 29 November 2012, p. v.
1286 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.
1287 ERA, *Final Decision on proposed revisions to the access arrangement for the Dampier to Bunbury Natural Gas Pipeline*, 31 October 2011, p. 143.
1288 NER 6.5.2(l), 6A.6.2(l); NGR 87(12).

G.5 Credit rating; Single benchmark across electricity and gas

As discussed below, we consider gas, electricity, distribution and transmission network service providers face a sufficiently similar degree of risk to apply one benchmark to calculate the rate of return for all of them. Adopting a single credit rating is consistent with a single benchmark. Applying this benchmark, we consider a benchmark efficient entity has a BBB+ credit rating.

The rate of return objective requires that a benchmark efficient entity must have a similar degree of risk as that which applies to the service provider.[1289] We consider the relevant risks between all energy network service providers are sufficiently similar for there to be a single benchmark efficient entity. Relevant risks are those compensated through the rate of return:

- Systematic risk is the only risk we compensate for through the return on equity.[1290]
- We only compensate for systematic risk, liquidity risk and default risk through the return on debt.[1291] In the Guideline, we noted that to the extent non-systematic risks create an expectation of default, the yield to maturity on debt will reflect this. We also considered that default risk was likely to be small for regulated energy networks.[1292]
- We compensate certain other business-specific risks through cash flows, rather than the rate of return.[1293] This is consistent with advice from McKenzie and Partington, who stated that if risks affect the expected cash flow, then we should account for them in the expected cashflow.[1294]

JGN submitted gas distribution service providers are more risk exposed than other energy networks.[1295] It is important to note that JGN forms this position to support applying a BBB credit rating to gas distribution service providers.[1296] However, because we use data from independent data service providers, we currently only have access to a broad BBB curve for estimating JGN's return on debt. Consequently, even if JGN's position, that had merit, our estimate of the return on debt would adequately compensate JGN for its efficient financing costs. Consequently, while we disagree with JGN's position, this disagreement makes no practical difference at present to our estimate of JGN's allowed return on debt.

Nevertheless, conceptual and empirical evidence supports our position to apply a single benchmark to all network service providers. We set this evidence out in the sections below.

G.5.1 Conceptual considerations

In the Guideline, we considered the different degrees of demand risk and competition risk between electricity and gas, and between transmission and distribution. This is because we were satisfied demand and competition were the two major sources of potentially different systematic risks.

1289 NER, cl. 6.5.2(c); NER, cl. 6A.6.2(c); NGR, r. 87(3).

1290 See Bishop, S.; Faff, R., Oliver, B., Twite, G., 'Corporate finance', Pearson Prentice Hall, 2004, Ed. 5, p. 145; Viney, C., 'McGrath's financial institutions instruments and markets, McGraw–Hill Australia, Ed 4, 2003, p. 223.

1291 See McKenzie and Partington, *Risk, asset pricing models and WACC*, 27 June 2013, p. 14. For information on the determinants of market interest rates, see Brigham, Daves 2007 'Intermediate financial management', Ed. 10, South-Western Cengage Leaning, p. 129.

1292 AER, *Explanatory statement to the rate of return guideline*, 17 December 2013, pp. 37–38.

1293 The regulatory regime compensates service providers for non-systematic risks through mechanisms like self-insurance allowances and cost pass throughs. See NER 6A.7.3, 6.6.1; NGR 97(1)(c), 531.

1294 McKenzie and Partington also state that if risks affect the covariance of cash flow with systematic risk factors, then we should account for them through the discount rate. See McKenzie and Partington, *Risk, asset pricing models and WACC*, 27 June 2013, p. 16.

1295 JGN, *2015–20 Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, pp. 10–11.

1296 JGN, *2015–20 Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, p. 12.

However, we concluded different energy network service providers would have similar exposure to these risks.[1297]

JGN submitted gas distribution service providers are more risk exposed than other energy networks because they face greater demand risk, sensitivity to other risk factors, 'fuel of choice risk', 'wholesale price risk' and 'supply shortfall risk'.[1298] We consider many of these risks relate to, or are simply different forms of demand and competition risks. For instance, if there is a shortfall in the supply of natural gas, this would increase wholesale prices, which will potentially decrease demand. Therefore, these relate to demand risk. Fuel of choice risk refers to consumers substituting gas for electricity, which relates to competition risk. Under 'sensitivity to other risk factors', JGN appears to describe various drivers of demand risk.

JGN proposed gas distributors would have greater exposure to these risks than other energy networks.[1299] We have had regard to the risks suggested in JGN's proposal. However, we disagree. We consider different energy networks would have similar exposure to these risks. This is because:

- The revenue or price setting mechanism (form of control) mitigates differences in demand risk for both gas and electricity service providers. Under revenue caps, service providers can adjust their prices to receive the approved revenue where forecast demand differs from actual demand. Under price caps, service providers may mitigate the risk of forecast error by restructuring tariffs to offset demand volatility.[1300]
- Demand for both gas and electricity is relatively inelastic.[1301] Further, both gas and electricity networks face relatively slow rates of technological change and consequently both face relatively low stranding risks.[1302]
- To the extent there are genuine risks of extreme changes in demand for specific service providers, the regulatory regime for gas and electricity can mitigate asset stranding risks through prudent discount and accelerated depreciation provisions.[1303]
- Gas and electricity network service providers operate regulated natural monopolies and face very little competition risk.[1304] While electricity and gas networks compete with one another at the margin, this has not caused major changes in the utilisation levels of existing gas or electricity network assets to date.[1305]

G.5.2 Empirical evidence

JGN submitted empirical evidence indicates gas and electricity service providers face different credit ratings.[1306] We do not agree with this position. Table 3-62 shows an update of empirical evidence.

1297 AER, *Rate of return guideline explanatory statement*, 17 December 2013, p. 33.
1298 JGN, *2015–20 Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, pp. 10–11.
1299 JGN, *2015–20 Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, pp. 10–11.
1300 AER, *Rate of return guideline explanatory statement*, 17 December 2013, p. 37.
1301 Bureau of Resource and Energy Economics, *Gas Market Report 2012*, Canberra, May 2012, p. 47. Since demand is inelastic, prices or incomes have to change significantly for consumers to change their demand for energy.
1302 Frontier Economics, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia*, July 2013, pp. 3–4.
1303 NER, cl. 6A.26. NGR, r. 96; NER, cls. 6.5.5(b)(1), 6A.6.3(b)(1), NGR, r.89(1).
1304 Frontier Economics, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia*, July 2013, p. 3.
1305 Frontier Economics, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia*, July 2013, p. 95.
1306 JGN, *2015–20 Access arrangement information: Appendix 9.10 Return on debt proposal*, 30 June 2014, pp. 11–12.

Table 3-62 Credit ratings for service providers in different industry segments[1307]

Gas service provider	Rating	Electricity service provider	Rating	Mixed service provider	Rating
APT Pipelines Ltd	BBB	ElectraNet Pty Ltd	BBB	DUET Group	N/A
ATCO Gas Australian LP	A-	SAPN (ETSA Utilities)	A-	AusNet Services	A-
DBNGP Trust	BBB-	Powercor Australia LLC	BBB+	SGSP Australia Assets Pty Ltd	BBB+
Energy Partnership (Gas)	BBB-	The CitiPower Trust	A-		
Envestra Ltd	BBB+	United Energy Distribution	N/A		

Source: Bloomberg (standard and Poor's), AER analysis.

We do not consider the information in Table 3-62 is sufficiently strong to justify applying separate benchmarks to gas and electricity service providers. This is for the following reasons:

- This sample shows it is possible for gas, electricity and mixed service providers to receive an A- credit rating.
- When we divide our comparator set up into industry segments, our sample size becomes particularly small. That is, we are left with a sample of five (gas), four (electricity) and two (mixed). We do not consider this sample is sufficiently robust to draw conclusions about different risks faced by electricity and gas service providers.
- We recognise all businesses in our comparator set are imperfect proxies for the benchmark efficient entity. For instance, most of the businesses in our comparator set also earn revenue from unregulated activities.[1308] One of the more prominent examples of this is APT Pipelines, where only 23 per cent of its revenue over the 2013/2014 financial year came from prices under full regulation.[1309] It is possible that perceived differences in risks between gas and electricity comparators relate to the unregulated activities they engage in. The allowed rate of return only compensates for risks associated with regulated activities.[1310]

G.6 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. It includes:

- the formula for automatic application

1307 Current as at August 2014.

1308 11% of Envestra's revenue came from unregulated activities. See Envestra, *Full year results 30 June 2014*, 14 August 2014, slide 16. About 9% of SAPN's revenue came from unregulated services. See SAPN, *Financial report 2013*, p. 22.

1309 This figure excludes pass throughs. See APA Group, *Full year results*, 20 August 2014, p. 2.

1310 The allowed rate of return is to achieve the allowed rate of return objective, which compensates for risks applying to the service provider 'in respect of the provision of standard control services' (NER cl. 6.5.2(c)). Note NER cl. 6A.6.2(c) specifies 'in respect of the provision of prescribed transmission services' and NGR r. 87(3) specifies 'in respect of the provision of references services'.

- adjustments to the published series
- assessment of the third party curves against the Guideline's criteria.

G.6.1 Formula for automatic application

As required under the rules,[1311] this section sets out our formula for automatic application when estimating the annual return on debt. These annual estimates will be used to update the trailing average return on debt. This formula is to be applied using the service providers' averaging periods for the return on debt, which are set out in confidential appendix I. 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 draft decision. In the event that data availability changes during the regulatory control process, the formula below will change to reflect the contingencies set out in section 3.4.2 of attachment 3.

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
   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,[1312] and the two nearest CGS bonds straddling 10 years remaining term to maturity. This should be done using the following formula: [1313]

   $$\text{yield}_{\text{interpolated}} = \text{yield}_{\text{lower straddle bond}} + (\text{yield}_{\text{upper straddle bond}} - \text{yield}_{\text{lower straddle bond}}) * (\text{date}_{\text{10 years from interpolation date}} - \text{maturity date}_{\text{lower straddle bond}}) / (\text{maturity date}_{\text{upper straddle bond}} - \text{maturity date}_{\text{lower straddle bond}}).$$

[1311] NER clause 6.5.2(l), NER clause 6A.6.2(l), NGR r. 87(12).

[1312] 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.

[1313] 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.

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:[1314]

   $yield_{10} = yield_{10\ year\ published} + [(spread\ to\ swap_{10\ year\ published} - spread\ to\ swap_{7\ year\ published})/(effective\ term_{10\ year\ published} - effective\ term_{7\ year\ published})] * (10 - effective\ term_{10\ year\ published})$.

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:[1315]

   $yield_{7} = yield_{7\ year\ published} + [(spread\ to\ swap_{10\ year\ published} - spread\ to\ swap_{7\ year\ published})/(effective\ term_{10\ year\ published} - effective\ term_{7\ year\ published})] * (7 - effective\ term_{7\ year\ published})$.

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.[1316]

8. Obtain daily RBA spread estimates by linear interpolation of the adjusted RBA spreads (from steps 5 and 6) for both 7 and 10 year terms between the published dates identified in step 2. Use the adjusted RBA spread estimates as calculated in step 6. This should be done using the following formula:

   $spread_{interpolated} = spread_{first\ straddling\ publication\ date} + (date_{interpolation} - date_{first\ straddling\ publication\ date}) * (spread_{second\ straddling\ publication\ date} - spread_{first\ straddling\ publication\ date}) / (date_{second\ straddling\ publication\ date} - date_{first\ straddling\ publication\ date})$

   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:[1317]

    $effective\ annual\ rate = ((1 + yield / 200)^2 - 1)*100$

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**.

[1314] As per Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

[1315] As per Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

[1316] 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.

[1317] 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'.

Calculation of the adjusted BVAL estimate

1. 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.[1318]

2. 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.[1319]

3. Convert these yields into effective annual rates, using the formula:

   effective annual rate = ((1 + 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.

G.6.2 Adjustments to the published series

As identified in attachment 3, we consider both the RBA curve and the BVAL curve require adjustments in order to be used for the purpose of estimating the benchmark return on debt. The following section describes in greater detail our reasons for these adjustments.

Extrapolation of the RBA curve

Our draft decision is to extrapolate the spread component of the RBA estimate from its published effective term to an effective term of 10 years. We will do this using one of the alternative methods outlined by Lally. Specifically, we will extrapolate it as follows:

$$RBA_{10} = RBA_{10\,effective} + \left[\frac{(Spread\ to\ swap_{10\,effective} - Spread\ to\ swap_{7\,effective})}{(Effective\ term_{10} - Effective\ term_{7})}\right] \times (10 - Effective\ term_{10})$$

Most service providers submitted that it was necessary to extrapolate the entire RBA published yield estimate.[1320] However, as demonstrated by Lally this is unnecessary.[1321] This is because the RBA's published 10 year yield already includes a base component at a 10 year effective term.[1322] That is, the RBA yield at 10 years is the sum of:

- the spread to swap at the published effective term (on average 8.7 years)
- the swap rate at 10 years effective term.

1318 Subject to the availability of the Bloomberg 7 year BVAL curve. For other contingencies, see section 3.4.2 of attachment 3.

1319 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.

1320 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, Transgrid, *Regulatory proposal*, June 2014, p. 178.

1321 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38-44.

1322 Available in the 'notes' tab of: RBA, RBA, *Aggregate measures of Australian corporate bond spreads and yields—F3,* Available at: http://www.rba.gov.au/statistics/tables/xls/f03hist.xls.

As the base component already matches the benchmark term (10 years), further extrapolating this component would result in overcompensation.

Extrapolation of the BVAL curve

Our draft decision is to extrapolate the 7 year Bloomberg broad BBB-rate BVAL curve using the margin between:

- the adjusted 7 year RBA BBB yield estimate
- the adjusted 10 year RBA BBB yield estimate.

Many service providers proposed to rely entirely on the RBA curve and as a result did not make submissions on extrapolation of the BVAL curve.[1323] However, JGN submitted a report by Incenta on extrapolation options for the BVAL curve.[1324] In order of preference, Incenta recommended:

- the QTC method—Queensland Treasury Corporation undertakes a quarterly survey of debt market participants in which respondents provide expectations of yields at various tenors. Using this data, which is not publicly available, QTC estimated an econometric relationship between the 7 and 10 year credit margin compared to the AFMA swap curve. Incenta adapted this relationship to express the 10 year DRP (relative to CGS) as a function of the 7 year DRP.
- the Bloomberg US BBB rate composite index—using the margin between the yields for 7 and 10 year tenors on one of Bloomberg's related US yield curves, swapped into AUD.
- the Bloomberg US BBB+ utilities index—using the margin between the yields for 7 and 10 year tenors on the US BBB+ utilities curve, swapped into AUD.
- the RBA method—using the change in the DRP for the RBA BBB rated curve between 7 and 10 years.
- the straight line method—extending the curve through the 5 and 7 year term points out to 10 years.

Having regard to Lally's analysis and Incenta's recommendations, we consider:

- the QTC method and the conversions required for the two Bloomberg US yield curves are more complex to update and implement than the alternatives. Specifically:
    - to remain up to date, the QTC method requires regular re-running of a regression to account for updated QTC survey data.[1325] This econometrically derived relationship describes the margin between 7 and 10 year spreads relative to the AFMA swap rate. This must therefore be converted to a similar relationship relative to CGS.[1326]

[1323] 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.

[1324] Incenta, *Methodology for extrapolating the debt risk premium*, Jun 2014.

[1325] Lally, *Implementation issues for the cost of debt*, November 2014, pp. 38–44.

[1326] Incenta, *Methodology for extrapolating the debt risk premium*, Jun 2014, pp. 7–8.

- use of either Bloomberg US yield curves requires swap rate and currency conversions using a series of different curves.[1327] This requires collection and use of additional data series and calculation steps.

- As acknowledged by Incenta, its tests of the QTC method are based on the use of the prior Bloomberg Fair Value Curve (BFVC), rather than the current BVAL curve as an input.

- the QTC method is based on data that is not publicly available—this limits the transparency and replicability of the method.

- As acknowledged by Incenta, the QTC method relies on quarterly survey data from a small number of market participants.[1328] As these individual survey estimates are not presently published, they are subject to limited scrutiny. Further, they are published infrequently, and it is therefore questionable whether the data is sufficiently timely for the purposes of estimating, for example, a 10 day averaging period several months removed from the last survey.

- Incenta's testing suggests the RBA approach performs best out of all the options tested against the paired bonds approach the AER used to extrapolate the Bloomberg BBB fair value curve over 2012 and 2013. While this is a short time series, it is relatively recent and reasonably robust.

- Most service providers submitted that the RBA approach should be used alone to set the return on debt.[1329] If it is assumed that both the RBA's 7 and 10 year term estimates are sufficiently robust for this purpose, we are satisfied it is reasonable to assume the margin from 7 to 10 years is a sufficiently simple and fit for purpose proxy for extrapolation.

G.6.3 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.[1330] Following the Guideline, we released an issues paper elaborating on the choice of a third party data service provider.[1331] In this issues paper, we set out the means by which these criteria could guide our analysis of this specific issue.[1332] Table 3-63, below, 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 energy network business operating within Australia". 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 attachment 3.

Table 3-63 Detailed 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	We are reasonably satisfied the BVAL curve's bond	We are reasonably satisfied the RBA curve's bond	We are satisfied a combination of curves is

[1327] Incenta, *Methodology for extrapolating the debt risk premium*, Jun 2014, p. 40.
[1328] Incenta, *Methodology for extrapolating the debt risk premium*, Jun 2014, p. 3.
[1329] 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.
[1330] AER, *Explanatory statement—Rate of return guideline*, December 2013, pp. 23–24.
[1331] AER, *Return on debt—Choice of third party data service provider: Issues paper*, April 2014.
[1332] AER, *Return on debt—Choice of third party data service provider: Issues paper*, April 2014, p. 11.

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.	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.	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.	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 purpose for which it was compiled and have regard to the limitations of that purpose ▪ promote simple over complex approaches where appropriate.	The BVAL curve is a par-yield curve,1333 which is consistent with the task of estimating the return on debt within the 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".1334 However, the proprietary curve fitting methodology is less transparent than the RBA's, limiting our ability to make a full assessment.	The RBA curve is an average of bond spreads with weights depending on target tenor. It is not a par yield curve, however the materiality of this shortcoming is likely to be small and would not systematically overestimate or underestimate compared to a par yield curve.1335	Using the two individual estimates as inputs, we are satisfied the simple average draws on the combined range of 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.[1336] Further, we note that the RBA also uses primarily the BVAL dataset in estimating its curve.[1337]	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.[1338]

[1333] 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.

[1334] REU, Return on debt estimation: a review of the alternative third party data series, August 2014, p. 13.

[1335] Lally, *Implementation issues for the cost of debt*, November 2014. P. 17-19.

[1336] REU, Return on debt estimation: a review of the alternative third party data series, August 2014, p. 16.

[1337] Arsov, Brooks and Kosev, 'New measures of Australian corporate credit spreads', *RBA bulletin*, December 2013.

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.[1339]. This contributes to the BVAL curve being timely, verifiable, comparable and clearly sourced. However, the BVAL curve is only published to 7 years.[1340] This means that we must extrapolate the BVAL curve to ensure it is comparable with our benchmark.	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.
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.

1338 Lally, *Implementation issues for the cost of debt*, November 2014, pp. 19-22.
1339 By 'curve constituents' we refer to the data points used in the calculation of its BVAL curve each day
1340 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.

H 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 draft decision forecast for debt raising costs, and in the capex attachment we included our draft decision forecast for equity raising costs. In this appendix, we set out our assessment approach and the reasons for those forecasts.

H.1 Equity raising costs

JGN applied our established method in proposing that it will not incur equity raising costs for the 2015–2020 regulatory control period.[1341] We accept JGN'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.

The Guideline does not set out an approach for estimating equity raising costs. However, 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).[1342] We amended this method in our decisions for the ACT, NSW and Tasmanian electricity service providers.[1343] We have applied this method in subsequent decisions for other electricity and gas service providers.[1344] This approach has been further refined, as discussed and applied in the Powerlink final decision.[1345]

H.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.

1341 JGN, *Access arrangement information*, June 2014, p. 91

1342 ACG, *Estimation of Powerlink's SEO transaction cost allowance–Memorandum*, 5 February 2007.

1343 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.

1344 AER, *Final decision, Victorian electricity distribution network service providers, Distribution determination 2011–2015*; AER, *Final Decision, Jemena Gas Networks, Access arrangement proposal for the NSW gas networks* ,1 July 2010 – 30 June 2015, June 2011.

1345 AER, Final decision Powerlink Transmission determination 2012–13 to 2016–17, April 2012, pp. 151–2.

H.2.1 Draft decision

We accept debt raising costs of $8.9 million (nominal) over the 2015–20 period, as set out in Table 3-64. We are satisfied this estimate reflects the costs that would be incurred by a prudent service provider acting efficiently to achieve the lowest sustainable cost of providing pipeline services.[1346]

Table 3-64 AER's draft decision on debt raising costs (millions, $ nominal)

	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Debt raising costs	1.6	1.7	1.8	1.8	1.9	8.9

Source: AER analysis.

In contrast, we are not satisfied that JGN's proposed total debt raising cost forecast of $22.2m (nominal) achieves these criteria. Specifically, JGN proposed three distinct categories of debt raising costs. Our decisions on the categories are as follows:

- debt raising transaction costs—[1347] we are satisfied JGN's proposed debt raising transaction cost method quantifies the efficient input costs required to achieve the opex objectives. While we accept JGN's proposed method for determining debt raising transaction costs, we have made changes to its projected capital base value through the 2015–20 period. This in turn results in changes to the debt component of JGN's capital base. This debt component is an input into JGN's proposed debt raising cost method and consequently affects the estimated amount of debt raising costs. Similarly, we have made changes to JGN's rate of return, which affects calculation of specific debt raising transaction cost line items. As this draft decision is based on indicative rates, the AER will update this analysis for the final decision based on the debt component of the capital base and rate of return to be determined at the time.
- Liquidity costs— we are not satisfied that JGN'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 JGN's benchmark rate of debt raising costs. This reduces the estimated debt raising cost allowance by $6.5 million or 29 per cent.
- Three month ahead financing— we are not satisfied that JGN'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 JGN's benchmark rate of debt raising costs. This reduces the estimate debt raising cost allowance by $5.3 million or 24 per cent.

H.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),[1348] commissioned by the ACCC in 2004. JGN's consultant Incenta has recommended a method for calculating debt raising transaction costs that is largely consistent with the ACG approach to debt raising transaction costs.[1349] However, Incenta has relied on updated market data from 2008–13, as submitted in a recent report by PwC during the rate of return guideline

[1346] NGR r. 91(1).
[1347] For simplicity, we refer to this component as debt raising transaction costs. Incenta refers to these as 'debt raising costs associated with the debt component of the RAB'.
[1348] The Allen Consulting Group, *Debt and equity raising transaction costs: Final report*, December 2004.
[1349] Incenta Economic Consulting, *Debt raising transaction costs–Jemena Gas Networks*, May 2014.

process.[1350] 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 capital base. 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 Incenta's updated approach to our standard approach, we have considered whether any updates contribute to a realistic estimate of JGN's efficient costs.

H.2.3 Reasons for draft decision

We accept JGN's method for determining debt raising transaction costs because it provides a realistic estimate of the efficient costs required to meet the criteria governing operating expenditure and is consistent with our established approach.[1351] Specifically, we consider JGN's proposed method:

- identifies the types of transaction costs that a prudent service provider would incur in raising debt.
- quantifies an efficient, prudent and realistic level of these costs, taking into account the specific circumstances of the service provider, with reference to market rates for the relevant services.

Our draft decision on the unit costs and components of JGN's benchmark rate of debt raising transaction costs is set out in Table 3-65.

Table 3-65 Benchmark debt raising costs (basis points per annum)

Number of bonds	Value	1 bond issued	7 bonds issued
Amount raised		$250m	$1,750m
Arrangement fee		7.38	7.38
Bond Master Program (per program)	$56,250	0.32	0.05
Issuer's legal counsel	$15,265	0.09	0.09
Company credit rating	$77,500	0.44	0.06
Annual surveillance fee	$35,500	0.14	0.02
Up-front issuance fee	5.20bp	0.73	0.73

1350 PricewaterhouseCoopers, *Energy Networks Association: Debt financing costs*, June 2013, p. i.
1351 NGR r. 91(1).

Registration up-front (per program)	$20,850	0.12	0.02
Registration- annual	$7,825	0.31	0.31
Agents out-of-pockets	$3,000	0.02	0.02
Total (basis points per annum)		9.5	8.7

Source: AER, Incenta.

We accept JGN's method and have updated the value that results in applying this method. JGN proposed debt raising transaction costs of 10 bppa or $10.5m (nominal) over the 2015–20 period based on Incenta's method.[1352] This method assumes standard $250 million tranches.[1353] Our draft decision includes the following adjustments:

- we have updated JGN's opening capital base—this affects the benchmark number of bond issues and as a result, the benchmark rate of debt raising costs.
- We have updated JGN's projected capital base—the projected capital base is multiplied by benchmark gearing to estimate the debt component of JGN's projected capital base. In turn, we multiply this by the benchmark rate for debt raising transaction costs to estimate the debt raising cost allowance.
- We have updated the individual transaction cost line items (including the arrangement fee) for the draft decision's opening capital base and rate of return. We have done these calculations in line with Incenta and PwC's descriptions of the basis on which the costs are allocated per program, per issue or per annum.

JGN submitted in its proposal that it had removed from its base year opex the cost of activities that were separately forecast, such as debt raising costs.[1354] In assessing whether JGN required specific compensation for debt raising transaction costs, we sought further information from JGN to demonstrate the removal of these costs from the base year.[1355] This is important to ensure debt raising costs are not 'double counted' from inclusion in both the base opex and the separate debt raising cost allowance. In response, JGN submitted that JGN does not undertake its own debt raising, but relies on fundraising by its parent group to fund investment in its network.[1356] JGN submitted it had not been charged for debt raising costs, and had therefore no adjustment to its base year was necessary. This statements appear contradictory and therefore do not provide us with full confidence that debt raising costs are not being 'double counted' in JGN's opex forecast. In this draft decision, we will adopt our standard approach to estimate benchmark debt raising costs, which is to include a separate allowance. However, in the final decision we may further investigate this matter to ensure that JGN is not being overcompensated for the debt raising costs of a prudent service provider, acting efficiently.

[1352] JGN, *Revenue forecast model,* June 2014.
[1353] Incenta Economic Consulting, *Debt raising transaction costs–Jemena Gas Network*, May 2014, p. 10.
[1354] JGN, *Appendix 7.2—Operating expenditure forecasting method and base year efficiency*, Jun 2014, p. 8.
[1355] AER, *Email: AER information request 003*, 8 July 2014.
[1356] JGN, Email: Re: AER information request 003, 9 July 2014.

Other debt raising costs

As well as debt raising transaction costs, JGN proposed to apply two additional forms of debt raising costs included in the Incenta report.[1357] 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 prudent service provider for the costs of efficiently raising its debt for the lowest sustainable cost of delivering pipeline services. 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.
- We are not satisfied that a prudent operator requires this additional expenditure. Most service providers who have recently submitted regulatory proposals appear to consider the additional debt raising cost categories are unnecessary to achieve a forecast opex allowance that is a realistic expectation of efficient costs required to meet to opex objectives.[1358] We have reached this conclusion because:
- AusGrid, Endeavour and Essential, while also submitting reports from Incenta, proposed only to apply the debt raising transaction costs.[1359] That is, AusGrid, Endeavour, Essential and Transend were aware of the additional cost categories proposed by JGN, but chose not to include these categories in their opex proposals.
- Similarly, Transend submitted a report from PwC recommending the same cost streams, but proposed only to apply the debt raising transaction costs.[1360]
- Directlink proposed to use the AER's normal approach in the PTRM, which allows debt raising transaction costs but does not include other debt raising costs.[1361]
- 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 JGN's proposed liquidity costs.

In 2002, Allen Consulting Group (ACG) provided the ACCC with a report on working capital.1362 Working capital is one measure of a service provider's liquidity. It is calculated as current assets

[1357] JGN, *Access arrangement information*, June 2014 , p. 77.
[1358] NGR r. 91(1).
[1359] Ausgrid, *Regulatory proposal*, May 2014, p. 78; Endeavour Energy, *Regulatory proposal*, May 2014, p. 117; Essential Energy, *Regulatory proposal*, May 2014, p. 102;
[1360] Transend, *Regulatory Proposal*, May 2014, p. 23.
[1361] Directlink, *Revenue proposal*, May 2014, p. 76.

minus current liabilities. 'Current' refers to assets/liabilities that will be realised/settled within 12 months. Strictly, JGN's proposed allowance is designed to meet S&P's definition of liquidity as opposed to working capital.[1363] 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 of financing operating expenditure (the required return on working capital). The report states:[1364]

> 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:[1365]

> 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.[1366] In comparison, JGN's proposed 'other' debt raising costs amount to 0.4 per cent of revenue.

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.[1367] 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.

We note that in a previous gas decision in 2012, Envestra also proposed an allowance for liquidity costs. [1368] We rejected these costs, primarily on the basis that our cash-flow timing assumptions in the PTRM provide implicit and sufficient compensation to cover liquidity costs.[1369] Envestra subsequently

---

1362 ACG, *Working capital—Relevance for the Assessment of Reference Tariffs*, March 2002,
1363 Incenta Economic Consulting, *Debt raising transaction costs–Jemena Gas Networks*, May 2014, p. 19
1364 ACG, *Working capital—Relevance for the Assessment of Reference Tariffs*, March 2002, p. 2.
1365 ACG, *Working capital—Relevance for the Assessment of Reference Tariffs*, March 2002, p. 24.
1366 ACG, *Working capital—Relevance for the Assessment of Reference Tariffs*, March 2002, p. 24.
1367 AER, *Issues Paper, Guidelines, models and schemes for electricity distribution network service providers*, November 2007, p. 11.
1368 For example: Envestra, *Victorian access arrangement information*, March 2012, pp. 163—164
1369 AER, *Draft decision: Envestra Victoria 2013–17: Attachments*, September 2012, pp. 199–201.

excluded the costs from its revised proposal. Neither JGN nor Incenta has engaged with the reasons set out in this decision. We consider the reasons set out in the Envestra decision remain valid. As a result, we are not satisfied that JGN'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 JGN'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.

Further, it appears that Incenta's estimation of the three month ahead financing costs uses inconsistent averaging periods. Specifically, Incenta's estimate of three month ahead financing costs is calculated as the difference between:[1370]

1. the interest costs on a 10 year benchmark BBB+ rated bond— Incenta submits that the service provider must raise this debt three months ahead of when it is required

2. the interest income from a 3 month debt instrument purchased with the proceeds of its debt raising—this offsets to some extent the yield costs described above.

Incenta has derived the interest income (item 2) using the three month spot rate based on a 20 business day average to 15 March 2013. Debt has been available more cheaply in the years since the GFC, resulting in a relatively low estimate of the interest income in item 2. In contrast, Incenta has calculated the projected interest costs (item 1) using JGN's proposed trailing average cost of debt for 2014-15. This is based on debt data for the last ten years, over which time the average is substantially higher than debt conditions in March 2013.[1371] This exaggerates the margin between the interest costs (item 1) and interest income (item 2). We would expect that the margin would be significantly lower if calculated using consistent averaging periods.

Overall, we are not satisfied that JGN's proposed allowance for three month ahead financing contributes to a realistic expectation of the input costs required to achieve the opex objectives. However, even if we did accept that this allowance was necessary, we consider that Incenta's proposed method results in an exaggerated estimate.

[1370] Incenta Economic Consulting, *Debt raising transaction costs–Jemena Gas Networks*, May 2014, p. 19
[1371] See our analysis of the return on debt.

I Equity and debt averaging periods (confidential)

This appendix contains sensitive information.