Rate of Return Guidelines

Meeting the requirements of the National Gas Rules

16 December 2013

Economic Regulation Authority

WESTERN AUSTRALIA

Contents

1 Introduction

1. The Authority's responsibilities under the National Gas Law (**NGL**) and the National Gas Rules (**NGR**) relate to approving third party access arrangements in Western Australia for the Dampier to Bunbury Natural Gas Pipeline, the Goldfields Gas Pipeline and the Mid-West and South-West Gas Distribution System.

2. Under the recent changes to the NGR, the Authority is required to produce rate of return guidelines at least every three years.[1] The guidelines provide an opportunity to undertake a comprehensive review of approaches for determining the rate of return on capital.

3. This Rate of Return Guidelines sets out the Authority's position.

4. The companion to this document – the Explanatory Statement for the Rate of Return Guidelines – sets out the Authority's reasoning for the positions contained in the Rate of Return Guidelines.

5. Inquiries on any matter related to the Rate of Return Guidelines may be addressed to:

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[1] National Gas Rules 87(13)

The requirement

6. The new NGR require that the rate of return guidelines set out:[2]

- the methodologies that the Authority proposes to use in estimating the allowed rate of return, including how those methodologies are proposed to result in the determination of a return on equity and the return on debt in a way that is consistent with the allowed rate of return objective; and

- the estimation methods, financial models, market data and other evidence that the Authority proposes to take into account in estimating the return on equity, the return on debt and the value of imputation credits referred to in NGR 87A.

7. In what follows, the Authority interprets that:

- A rate of return 'approach' refers to the systems or methods used in development of the rate of return guidelines, and encompasses the subsidiary methodologies, estimation methods, financial models, market data and other evidence.

- 'Estimation methods' provide for the procedures used for estimating the rate of return, including through financial models.

- 'Financial models' refer to those mathematical and statistical representations that are used to inform the rate of return, such as, for example, the Sharpe-Lintner Capital Asset Pricing Model.

- 'Market data' refers to any input data that is utilised for the rate of return, and may include, for example, financial data, or sample data from firms comparable to the benchmark.

- 'Other evidence' may be broad ranging, but needs to be 'relevant' to the estimation of the rate of return to be considered.

- The term 'estimation material' may be used to refer to any of the relevant information relating to estimation methods, financial models, market data and other evidence.

8. The rate of return guidelines will provide guidance for subsequent gas access decisions of the Authority for the three Western Australian gas pipelines and networks. However, the rate of return guidelines are not mandatory.[3] The Authority or service providers may depart from the guidelines in reviewing an access arrangement, provided that an adequate explanation for any proposed change, in terms of the NGL and NGR, is provided at the time of the review.

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[2] National Gas Rules (14)

[3] National Gas Rules (18)

2   The broad regulatory framework

9.   This section sets out the Authority's views on the regulatory framework that informs the development of the rate of return guidelines. It first sets out the origins of, and the current broad approach to, regulation of energy utilities in Australia. It then summarises the requirements of the National Gas Law and the National Gas Rules, and draws on these to articulate a framework for the rate of return regulatory decision making process.

10.   The section then draws on this framework to develop a set of criteria that the Authority considers are consistent with the requirements of the NGL and the NGR. The Authority will use the criteria as a means to communicate its decisions to readers, particularly where it is required to exercise judgment.

Incentive regulation

11.   Incentive regulation has a reasonably short history in Australia. Up until 1990, public ownership of monopoly infrastructure was common, largely a legacy of historic decisions by government relating to development. Public ownership gave governments the scope to control output, to ameliorate monopoly rents, and to influence levels of investment and operating costs.

12.   However, it came to be recognised that this approach often entailed significant economic loss, as it did not provide the expected discipline on inefficient investment and operating expenditures.

13.   This situation contrasted with that in the United States, where private ownership and statutory monopoly regulation through independent 'cost of service' (or rate of return) regulation had existed for much of the 20th Century. Nevertheless, it was recognised during the 1960s that this approach could also lead to inefficiencies, such as the tendency to increase capital investment (the 'Averch Johnson' effect). Some economists suggested that the outcomes were no better than unregulated monopoly.

14.   By the 1980s, new regulatory approaches were being developed:[4]

> Beginning in the 1980s, theoretical research on incentive regulation rapidly evolved to confront directly imperfect and asymmetric information problems and related contracting constraints, regulatory credibility issues, dynamic considerations, regulatory capture, and other issues that regulators have been trying to respond to for decades but in the absence of a comprehensive theoretical framework to guide them.

15.   This led to a rapid change in approach from the late 1980s to adopt 'incentive regulation:[5]

> What do we mean by incentive regulation? In particular, it means that the regulator delegates certain pricing decisions to the firm and that the firm can reap profit increases from cost reductions. Incentive regulation makes use of the firm's information advantage and profit motive. The regulator thus controls less behaviour but rather rewards outcomes.

> Worldwide, the introduction of incentive regulation has been part of the regulatory reform movement, consisting of privatization, liberalization and deregulation...

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4   Joskow P. 2006, *Incentive Regulation in Theory and Practice: Electricity Distribution and Transmission Networks*, Cambridge Working Papers in Economics 0607, http://ideas.repec.org/s/cam/camdae.html.

5   Vogelsang I. 2002, Incentive Regulation and Competition in Public Utility Markets: A 20-Year Perspective, *Journal of Regulatory Economics*; 22:1, p. 6.

> ...The most important types of incentive regulation have been price caps, rate case moratoria, profit sharing, banded rate of return regulation, yardstick regulation, and menus. Overall, price caps have become the most widespread...

> ...Price caps are defined by an index of the regulated services that is adjusted annually by (1) an inflation factor that takes care of the economy-wide price level or of the level of input prices, (2) an X-factor that reflects efficiency improvements of the firm, and (3) a Y-factor that allows for pass-through of specific cost items outside the firm's control. The index is further adjusted in regulatory proceedings over the longer-term.

Incentive regulation in Australia

16. The policy response in Australia was to initiate and adopt the recommendations of the 1993 National Competition Policy Review, by the 'Hilmer' Independent Committee of Inquiry, which set out a comprehensive program of microeconomic reform for the monopoly utility sector.[6] The Hilmer review's proposed reforms for competition policy included the restructuring of public sector monopoly businesses, and the arrangements to facilitate third party access to nationally significant infrastructure. The intent was to introduce the discipline of competitive markets wherever possible, and to regulate for efficiency in the remaining monopoly elements.

17. These proposals were subsequently broadly implemented by the Council of Australian Governments, through the Competition Principles Agreement of 1995 and associated reforms. In addition, under clause 2 of the Competition Principles Agreement, states and territories undertook to establish independent sources of prices oversight for their monopolistic business enterprises.

Incentive regulation for gas infrastructure

18. These arrangements, once established, continued to evolve. In the case of gas, the updated 2009 National Gas Law (**NGL**) provides for a legislated uniform national framework governing access to monopoly gas infrastructure, and arrangements for prices oversight. The national gas objective (**NGO**) sets out the aim of the NGL:[7]

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

19. The Authority notes that it is clear that the NGL and the NGO is intended to promote economic efficiency:[8]

> The national gas objective is an economic concept and should be interpreted as such.

> The long term interest of consumers of gas requires the economic welfare of consumers, over the long term, to be maximised. If gas markets and access to pipeline services are efficient in an economic sense, the long term economic interests of consumers in respect of price, quality, reliability, safety and security of natural gas services will be maximised. By the promotion of an economic efficiency objective in access to pipeline services, competition will be promoted in upstream and downstream markets.

20. A number of revenue and pricing principles (**RPP**) in the NGL give effect to the objective.[9] The RPP establish that the NGO is to be promoted by targeting economically efficient outcomes, through effective incentives for efficient investment in

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6. For a summary, see http://ncp.ncc.gov.au/pages/reform.

7. Western Australian Government Gazette 2009, *National Gas Access (WA) Act 2009*, www.slp.wa.gov.au, p. 76.

8. National Gas (South Australia) Bill 2008, *Second Reading Speech*, www.ret.gov.au, p. 4.

9. Ibid.

infrastructure and efficient provision of services and the use of the infrastructure, specifically:[10]

A service provider should be provided with effective incentives in order to promote economic efficiency with respect to reference services the service provider provides. The economic efficiency that should be promoted includes—

(a) efficient investment in, or in connection with, a pipeline with which the service provider provides reference services; and

(b) the efficient provision of pipeline services; and

(c) the efficient use of the pipeline.

21. This specification of 'effective incentives in order to promote economic efficiency' in the RPP is entirely consistent with the incentive regulation approach. Incentive regulation provides an opportunity for the regulated utility to perform better than the regulator's ex ante forecasts of its costs. Subsequent savings are then shared between the utility and consumers. This is recognised as creating incentives for outcomes that are more efficient, and hence in the long term interests of consumers.

22. With regard to rate of return, the Australian Energy Market Commission has established the allowed rate of return objective in the National Gas Rules (**NGR**):[11]

The allowed rate of return objective is that the rate of return for a service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services

23. In this context, the AEMC stated in its final rule determination that the new allowed rate of return objective is intended to be consistent with the National Electricity Objective (**NEO**), the NGO and the RPP:[12]

The Commission has taken the opportunity in this final rule determination to explain how the new rules are to be interpreted. Most importantly, the new rules allow the regulator (and the appeal body) to focus on whether the overall rate of return meets the allowed rate of return objective, which is intended to be consistent with the NEO, the NGO and the RPP.

Other elements in the new National Gas Rule 87

24. The NGR 87 includes a number of sub-rules which refer to matters the regulator is to have 'regard' to, when determining the allowed rate of return, including:

NGR 87(5) In determining the allowed rate of return, regard must be had to:

(a) relevant estimation methods, financial models, market data and other evidence;

(b) the desirability of using an approach that leads to the consistent application of any estimates of financial parameters that are relevant to the estimates of, and that are common to, the return on equity and the return on debt; and

(c) any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt.

NGR 87(7) In estimating the return on equity under subrule (6), regard must be had to the prevailing conditions in the market for equity funds.

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[10] National Gas Law 24(3).

[11] Australian Energy Market Commission 2012, *National Gas Rules*, www.aemc.gov.au, clause 87(3); or, in shorthand National Gas Rules 87(3).

[12] Australian Energy Market Commission 2012, *Rule Determination: National Electricity Amendment (...) Rule 2012*, www.aemc.gov.au, 29 November, p. 23.

NGR 87(11) In estimating the return on debt under subrule (8), regard must be had to the following factors:

(a) 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 ;

(b) the interrelationship between the return on equity and the return on debt;

(c) 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; and

(d) 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.

25.   In addition, the NGR 87 sets out a number of additional requirements for the allowed rate of return, including that:[13]

- it is to be determined such that it achieves the allowed rate of return objective (NGR 87(2));

- subject to the rate of return objective (NGR 87(2)), the allowed rate of return for a regulatory year is to be:

    – a weighted average of the return on equity for the access arrangement period in which the regulatory year occurs and the return on debt for that regulatory year (new NGR 87(4)(a));

    – determined on a nominal vanilla rate of return that is consistent with the estimate of the value of imputation credits (new NGR 87(4)(b));[14]

- results in a return on debt for a regulatory year which contributes to the achievement of the allowed rate of return objective (NGR 87(8)) which is either the same in each year of the access arrangement period or which varies in each year through the application of an automatic formula (NGR 87(9) and NGR 87(12));

- incorporates a return on debt that would be required by debt investors over a relevant time period (whether shortly before the access arrangement decision, or on average over an historical period, or some combination of the two approaches) (NGR 87(10)).

Implications for the regulator

26.   The anchor for any regulatory decision will be the regulatory approach that is considered to best deliver the requirements of the NGL, NGR, NGO, RPP and the allowed rate of return objective. The Authority considers that this requirement may be summarised in terms of an objective function, and a number of constraints:

a)   The primary objective is to achieve an allowed rate of return for a service provider 'commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk in respect of the provision of reference services'.[15] Related objectives include a need to achieve the allowed rate of return:

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[13] The points are paraphrased – see the National Gas Rules for exact language.

[14] The specification of a vanilla WACC implies that tax liabilities must be estimated separately to the rate of return. On this basis, the requirement is for a 'post-tax' approach.

[15] National Gas Rule 87(3) – the allowed rate of return objective.

    i)   for each of the regulatory years;[16]

    ii)   incorporating effective incentives to promote efficient investment;[17]

    iii)   that is in the long term interests of consumers.[18]

b) A constraint is that uncertainty about the future, information asymmetries, and circularity problems complicate the task of determining the rate of return. On this basis, it is recognised that the regulator needs to estimate a cost of debt and cost of equity which gives the efficient service provider 'reasonable opportunity' to recover at least the efficient costs it incurs over the regulatory period.[19]

c) A further constraint is a requirement to minimise transaction costs for the service provider and regulator.

27. The current regulatory approach assumes that the efficient firm that meets the above objectives provides the 'benchmark'. The 'benchmark efficient firm' informs the cost building blocks for each regulatory decision.

28. An implication of point a) is that the rate of return must remunerate the efficient financing costs of the service provider over the lives of the assets, in terms of net present value.[20]

29. The implication of the efficiency element of point a) is that the benchmark firm is assumed to be on or near the efficiency frontier, consistent with the performance and cost structure of an efficient service provider. The efficient firm would be part of the portfolio of efficient assets held by an investor:

- The benchmark firm's efficient cost of finance will reflect the prevailing conditions in capital markets for the cost of debt and equity, taking into account its risk. The resulting discipline on its cost structure is entirely consistent with that faced by firms in effectively competitive markets, where prices, and returns, are set with reference to the prevailing cost of capital.

- An implication of adopting the benchmark efficient firm is that the actual decisions of the service provider may differ (and often will differ) from the benchmark firm. However, under incentive regulation the regulator does not compensate the regulated service provider for its actual decisions, but compensates it as if it were operating efficiently. If the service provider is not actually operating efficiently relative to the benchmark then that is a matter for management and the shareholders of the service provider.

- In addition, the benchmark cannot be purely hypothetical. The benchmark should be based on the actual costs and risks faced by an efficient service provider.

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[16] National Gas Rule 87(4).

[17] National Gas Law 24(3) – a Revenue and Pricing Principle – states that the 'a service provider should be provided with effective incentives to promote economic efficiency with respect to reference services'. Note that the AEMC has stated that 'The Commission has taken the opportunity in this final rule determination to explain how the new rules are to be interpreted. Most importantly, the new rules allow the regulator (and the appeal body) to focus on whether the overall rate of return meets the allowed rate of return objective, which is intended to be consistent with the NEO, the NGO and the RPP' (Australian Energy Market Commission 2012, *Rule Determination: National Electricity Amendment Rule 2012*, www.aemc.gov.au, 29 November, p. 23.

[18] As per the National Gas Objective.

[19] National Gas Law 24(2) – a Revenue and Pricing Principle – states that the 'service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs'.

[20] This is consistent with the 'NPV=0', or 'present value' condition. For more detail, refer to Appendix 2 – The present value principle.

- The benchmark approach provides high powered incentives for the regulated business. If the regulated business is able to exceed the benchmark performance, it is able to retain any increased profits during the regulatory period. If the regulated firm fails to achieve the benchmark, then its bears the relevant losses.

30. The efficient firm would provide reference services in a way which meets consumers' preferences with regard to price, quality, reliability, safety and security, thereby meeting the requirement of a)(iii).

31. An implication of the subsidiary objective of point a)(i) relating to regulatory years is that the allowed rate of return objective looks forward to the actual regulatory years of the access arrangement period.

32. An implication of the subsidiary objective of point a)(ii) relating to effective incentives is that best practice regulation will generally set an estimated return ex ante, and then allow the firm to capture a portion of any subsequent out-performance. A portion of the out-performance resulting from this incentive regime ultimately may be shared with consumers.

33. An implication of point a)(i) and point b) is that the regulator sets the rate of return based on the most 'reasonable' predictors of the cost of debt and the cost of equity for the future regulatory years.[21]

34. An implication of point c) is that regulators are reluctant to revisit the returns to the firm too frequently, particularly where this significantly increases the transactions costs for both the regulator and the firm, or where it reduces the power of any incentives associated with an ex ante approach. Current practice is to set the regulated return for a five year period.

Criteria for application of regulatory discretion

35. The Authority considers that 'criteria' will help to inform stakeholders of its reasoning where it is applying regulatory discretion in determining the best approach for meeting the allowed rate of return objective and related NGR for the rate of return.

Approach

36. The Authority considers that the criteria necessarily need to be consistent with the requirements of the NGL, the NGO, the NGR and the allowed rate of return objective. The requirements of the NGL, the NGO, the NGR and the allowed rate of return objective have primacy at all times. The criteria allow the Authority to articulate its interpretation of these requirements set out in the NGL and the NGR.

37. The following criteria are not intended to supplant the NGL and NGR. Rather they are subordinate to the requirements set out in the two instruments. That said, the Authority considers it desirable if the proposed rate of return methods are:

- driven by economic principles
    - based on a strong theoretical foundation, informed by empirical analysis;
- fit for purpose;

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[21] National Gas Law 24(2) – a Revenue and Pricing Principle – states that 'a service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs...'.

- – able to perform well in estimating the cost of debt and the cost of equity over the regulatory years of the access arrangement period;

  – implemented in accordance with best practice;

- supported by robust, transparent and replicable analysis that is derived from available, credible datasets;

  – based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to small changes in the input data;

  – based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound rationale;

- capable of reflecting changes in market conditions and able to incorporate new information as it becomes available;

- supportive of specific regulatory aims; and thereby:

  – recognise the desirability of consistent approaches to regulation across industries, so as to promote economic efficiency;

  – seek to achieve rates of return that would be consistent with the outcomes of efficient, effectively competitive markets;

  – as far as possible, ensure that the net present value of returns is sufficient to cover a service provider's efficient expenditures (the 'NPV=0' condition);

  – provide incentives to finance efficiently;

  – promote simple approaches to estimating the rate of return over complex approaches where appropriate;

  – promote reasoned, predictable and transparent decision making;

  – enhance the credibility and acceptability of a decision.

3   Overall rate of return

38.   The Authority is required to adopt a 'nominal vanilla' weighted average cost of capital (**WACC**) in developing the rate of return for the benchmark efficient entity.[22]

39.   A vanilla WACC would not include any adjustment for tax impacts, for example, in relation to the effect of imputation credits on the rate of return. The impact of tax on the returns would need to be accounted for separately, as an explicit deduction from the relevant cash flows. A vanilla WACC is therefore a 'post-tax' framework.

40.   The nominal vanilla WACC provides for a simple weighted average of the nominal post-tax return on equity and the nominal return on debt. A range of issues may considered be in this context, including:

- the term of the return on equity and the return on debt;
- whether to adopt ranges or point estimates; and
- reasonableness checks.

Approach

41.   The Authority will adopt the following approach for its future regulatory decisions.

A nominal post tax model

42.   The Authority will apply an explicit nominal post tax modelling approach for its future decisions.

43.   The Authority considers that the Australian Energy Regulator's Post Tax Revenue Model (**PTRM**), or a similar model, will provide a basis for future access arrangement determinations.[23] The PTRM will enable the Authority to utilise a nominal vanilla rate of return.

44.   The PTRM deals with tax explicitly through operating cash flows, which is therefore consistent with the use of the nominal vanilla rate of return.

Components of the rate of return

45.   The Authority will adopt a weighted average cost of capital (**WACC**) for a benchmark efficient entity in its simplest 'vanilla' form, expressed as:

$$WACC_{vanilla} = E(r_e)\frac{E}{V} + E(r_d)\frac{D}{V}$$
(1)

where

$E(r_e)$ is the expected return on equity;

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[22] National Gas Rules 87(4).

[23] As noted in the Authority's Consultation Paper, there will be a number of transitional issues in moving from a real model to a nominal model, particularly with regard to tax depreciation. However, these issues are outside the scope of this Rate of Return Guideline.

$E(r_d)$ is the expected return on debt;

E/V is the proportion of equity in total financing (comprising equity and debt); and

D/V is the proportion of debt in total financing.

The term of the rate of return

46. The term of the estimates for the rate of return will be, as far as possible, consistent with the term of the regulatory period.

47. Accordingly, as the regulatory period for the Authority's gas pipeline and networks decisions is five years, the term of its estimates for the rate of return will generally be five years (see Section 6 – Return on debt for more detail).

Point estimates or ranges?

48. The Authority will establish point estimates at the parameter level. These point estimates may be determined from within a range, or derived directly. Such point estimates would then inform a single point estimate for an estimation method or financial model.

49. Similarly, the Authority will seek to establish point estimates at the level of the return on equity and the return on debt. These point estimates may be derived from a single estimation method, or from a range informed by multiple estimation methods, financial models, market data or other evidence.

50. Where single point estimates are derived from a range, the Authority recognises that it may be appropriate in some circumstances to adopt a formal weighting approach to inform the final estimate. In other cases, the Authority will need to exercise its judgment, articulating any reasons that inform its decisions.

51. The use of a single point estimate for the return on equity and the return on debt will lead to a single point estimate for the rate of return. The single point estimate of the rate of return will be facilitated by a single point estimate of the gearing level.

Requirement to meet the allowed rate of return objective

52. The Authority will evaluate its estimate of the allowed rate of return in terms of the requirements of the allowed rate of return objective and the NGR more broadly. In particular, the Authority will consider whether its allowed rate of return estimate is reasonable for a benchmark efficient entity with a similar degree of risk as the service provider in respect of the provision of the reference services.

4 The benchmark efficient entity and compensation for risk

53. The allowed rate of return objective is set out at National Gas Rule (**NGR**) 87(3):[24]

> 87(3) The allowed rate of return objective is that the rate of return for a service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services (the allowed rate of return objective).

Approach

54. The wording of the allowed rate of return objective requires that the rate of return is to be based on:

- the efficient financing costs;
- of a benchmark efficient entity;
- with a similar degree of risk as the service provider in respect of the provision of reference services.

55. The Authority's approach to each of these elements is defined in what follows.

Efficient financing costs

56. Financial markets will provide the observations required to evaluate the efficient financing costs of the benchmark efficient entity.

57. The Authority will constrain the estimation boundaries for the rate of return to domestic financial markets.

The benchmark efficient entity

58. The Authority defines the benchmark efficient entity as:

> An efficient 'pure-play' regulated gas network business operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services.

59. The Authority will base its estimates of efficient financing costs on the results from a sample of comparator firms with efficient financing costs that are judged to be 'similar' to a single benchmark efficient entity for the provision of gas pipeline and network services in Australia.

Accounting for risk

60. The Authority will use its judgment to determine whether it needs to adjust the parameters, the return on equity, the return on debt, or the overall rate of return, in order to account for any material and substantiated difference in risks identified by the regulated entity relating to providing the reference services, as compared to the risks associated with the benchmark efficient entity.

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[24] Australian Energy Market Commission 2012, *National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012 No. 3,* www.aemc.gov.au, 87(3).

5 Gearing

61. Under the National Gas Rules (**NGR**) the allowed rate of return for a regulatory year is to be a weighted average of the return on equity for the access arrangement period in which that regulatory year occurs and the return on debt for that regulatory year.[25]

62. Gearing refers to the proportions of a regulated business' assets assumed to be financed by debt and equity. Gearing is defined as the ratio of the value of debt to total capital (i.e. including debt and equity), and is used to weight the costs of debt and equity when the regulated weighted average cost of capital (**WACC**) is determined. The relative proportions of debt and equity that a firm has outstanding constitute its capital structure. The capital structure choices differ across industries, as well as for different companies within the same industry.

63. In addition to being used to weight the expected returns on debt and equity to determine the regulated rate of return, the level of gearing of a benchmark efficient business may also be used: (i) to re-lever asset betas for the purposes of analysing the level of systematic risk across businesses in the estimate of equity beta; and (ii) as a factor in determining an appropriate credit rating for deriving the debt risk premium (**DRP**).

Approach

64. The Authority considers that gearing should be determined from the average gearing level of a benchmark sample of Australian utility businesses subject to similar risk as the regulated entity in providing the reference services.

65. Companies included in the benchmark sample used to derive a benchmark gearing level for gas regulated businesses must be comparable to the benchmark efficient entity and hence of similar risk. The Authority's definition of the benchmark efficient entity was set out in section 2 as follows:

> An efficient 'pure-play' regulated gas network business operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services.

66. To be consistent with this definition, the Authority considers that in order to inform the gearing of the benchmark efficient entity, comparators for estimating gearing should have the following characteristics:

- First, the company must be a network service provider in the gas and/or electricity industry in Australia – the Authority considers that gas and electricity networks have similar risk.

- Second, the company must be listed so that the market value of its equity can be estimated using available data sources such as Bloomberg.

- Third, data on the values of debt and equity must be available.

67. The Authority's recent analysis, using the updated data set from 2008 to 2012, indicates that a benchmark gearing level of 60 per cent debt is appropriate. This benchmark gearing of 60 per cent has consistently been used by Australian economic regulators over the past decade for their regulatory decisions. The Authority considers that a 60 per cent debt to total capital ratio is fit for purpose, and will meet the allowed rate of return objective.

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[25] National Gas Rules 87(8).

6   Return on Debt

68. Under the National Gas Rules (**NGR**) the Authority is required to estimate the return on debt in a way that contributes to the achievement of the allowed rate of return objective.[26]   Subject to that overarching requirement, the methodology adopted to estimate the return on debt, may, without limitation, be designed to result in the return on debt reflecting:[27]

  - 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 time when the regulator's decision on the access arrangement for that access arrangement period is made;

  - 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; or

  - some combination of the above returns.

69. This section sets out the approach the Authority will adopt to estimate the return on debt.

Approach

70. The Authority will base its estimates of the return on debt on a risk premium over and above the risk free rate, combined with a margin for administrative and hedging costs:

    Return on Debt = Risk Free Rate + Debt Risk Premium + Debt raising costs +
    Hedging costs

Annual update of the return on debt

71. The Authority will annually update the return on debt, to reflect annual updates to the estimate of the debt risk premium. The other components of the return on debt – the risk free rate and the allowances for debt raising costs and hedging costs – will be set once, at the start of the regulatory period, and apply unchanged for each subsequent regulatory year in the regulatory period.

72. The Authority will publish the resulting return on debt on its website just prior to the commencement of each regulatory year. Revenue and prices to apply in the relevant regulatory year will be adjusted commensurate with the updated return on debt, as part of the annual tariff update, through an automatic update mechanism.

73. The risk free rate will be based on the observed yield of a 5-year term Commonwealth Government Security, averaged over a 40 day period just prior to the regulatory period (see Chapter 7 – Risk free rate of return). This rate will apply in each regulatory year. The 5-year term reflects the present value principle that the term of debt should match the regulatory update period, which is five years.

74. The debt risk premium will be derived from the yield to maturity of an observed sample of bonds issued by comparator firms with similar credit ratings as the regulated entity (see Chapter 8 – Benchmark credit rating and Chapter 9 – Debt risk premium). The debt risk premium will updated annually, in recognition that it is difficult for firms to

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[26] National Gas Rules 87(8).

[27] National Gas Rules 87(10).

manage risk related to changes in this component of debt, given the lack of hedging instruments.

75.   An annual allowance will be provided for debt raising and hedging costs (see Chapter 13 – Debt and equity raising costs). The annual allowance would be set once, at the start of the regulatory period.

76.   As only the estimate of the debt risk premium is updated annually, the approach constitutes a 'partial update' approach. The Authority is of the view that this 'partial update' approach for determining the cost of debt is the approach that best meets the requirements of the National Gas Law, the NGR and the allowed rate of return objective. The approach takes account of the Authority's considerations with regard to efficiency, as well as the stated desire of gas retailers for stability in gas network tariffs.

Initial revenue path

77.   The return on debt estimated for the first regulatory year – based on the sum of the estimates for the first year of the risk free rate, the debt risk premium and the allowances for debt raising costs and hedging costs – will contribute to the setting of the 'initial revenue path' for remaining years two to five of the regulatory period. As a result, the initial revenue path would be the same as that under the Authority's previous approach, where the return on debt was estimated once – at the start of the regulatory period – and applied for the duration of the regulatory period.

Implementing the annual update

78.   The Authority will implement the annual update by setting tariffs – for regulatory years two to five – by including an automatic cash flow adjustment to the 'initial revenue path' in each respective year. The adjustment would account for the difference in revenue arising from the difference in the rate of return on debt under the 'initial revenue path' and the annually updated rate of return on debt in each subsequent, respective regulatory year. The difference in the rate of return on debt will reflect the change in the debt risk premium.

79.   First, the cash flow allowance for the return on debt in any regulatory year t may be defined as:

$$RoD_t = (DRP_t + R_f + Drc + Hc). \; \frac{D}{(D+E)} . \; RAB_{Op,t} \qquad (2)$$

where

RoD_t is the return on debt in year t;

DRP_t is the initial debt risk premium;

R_f is nominal risk free rate;

Drc is the debt raising cost;

Hc is the hedging cost;

$\dfrac{D}{(D+E)}$ is the gearing;

$RAB_{Op,t}$ is opening Regulated Asset Base in year t; and

t ranges from year 1 to 5.

80. The 'initial revenue path' would be calculated in line with the above formula, using the DRP_t that is estimated for year 1 (that is, DRP_1).

81. The formula for calculating the subsequent annual adjustment to the 'initial revenue path' for a change in the estimate of the debt risk premium will be as follows:

$$\Delta RoD_t = \frac{D}{(D+E)} . \Delta DRP_t . RAB_{Op,t} \qquad (3)$$

where

ΔRoD_t is the change in the allowance for the return on debt in year t

$\dfrac{D}{(D+E)}$ is the gearing;

ΔDRP_t is the change in debt risk premium in year t defined as: $(DRP_t - DRP_1)$;

DRP_1 is the initial debt risk premium estimated at the start of the regulated period;

$RAB_{Op,t}$ is the opening Regulated Asset Base in year t; and

t is the regulatory year, ranging from year 2 to 5.

82. Under this formula, all return on debt amounts remain unchanged from those provided in the 'initial revenue path' in the final access decision, except for the annual allowance ΔRoD_t reflecting the change in the DRP in the regulatory years 2 to 5.

Alternatives for estimating the return on debt

83. In its review, the Authority considered annual updates of the risk free rate, in addition to the annual updates the debt risk premium, as a means to signal more frequent changes in the cost of debt, and thereby enhance outcomes with respect to economic efficiency.

84. However, the Authority recognised that annually updating the risk free rate could lead to significant fluctuations in tariffs from year to year. The Authority notes that gas retailers have expressed a preference for stable gas network tariffs. This preference has a bearing on the considerations of the Authority with regard to the long term interests of consumers. On this basis, the Authority has decided to only update the debt risk premium annually, rather than opting for the 'full annual update' of the risk free rate and the debt risk premium.

85. The resulting 'partial annual update' should lead to more stable tariffs through the regulatory period, as it is the risk free rate that drives much of the fluctuations observed over time in the return on debt. The debt risk premium will still be annually updated, but is not expected to change significantly under usual circumstances, such that any resulting volatility in the return on debt over the regulatory period is likely to be reasonably small. The Authority considers that updating the debt risk premium on an annual basis is an important efficiency consideration, given the inability of firms to hedge this component of the return on debt.

86. Nonetheless, the Authority will consider proposals from service providers in their proposed access arrangement revisions for such a 'full annual update', in recognition of the desirable characteristics of this approach with regard to economic efficiency.

87. As changes in the risk free rate drive volatility in the cost of debt most of the time, such a full annual update would be expected to lead to less stable estimates of the return on debt during the regulatory period. The Authority therefore would not expect to accept a full update proposal, in place of the partial update approach, unless the service provider was able to demonstrate the widespread support of customer groups. As part of demonstrating customers' support, the Authority expects that the service provider would explore with customer groups a range of alternative, market-based means to manage volatility, as a means to address customer preferences for stability.

88. In the event service providers are able to demonstrate support for the full annual update approach, then:

- the risk free rate would be based on the observed yield of a 1-year term Commonwealth Government Security, averaged over a 40 day period just prior to start of the regulatory year;

    - the 1-year term would be consistent with the present value principle, as the regulatory period on this component would now be one year;

- the debt risk premium would continue to be updated annually;

- the resulting estimate would contribute to the revenue path, and to annual update automatic formula in each respective regulatory year;

- the Authority would implement the annual update by setting tariffs, for regulatory years two to five, by including an automatic cash flow adjustment to the revenue path in each relevant year, using a similar formula to that set out above at equation 3.

7   Risk free rate of return

89.   The risk free rate of return is a key input to the Authority's approach to estimating the return on equity and the return on debt.

90.   The risk free rate is the rate of return an investor receives from holding an asset with a guaranteed payment stream, that is, where there is no risk of default. Since there is no likelihood of default, the return on risk free assets compensates investors for the time value of money.

91.   The risk free rate of return can be estimated as either a nominal or real risk free rate. The nominal risk free rate includes compensation to investors for the reduction in purchasing power caused by inflation. The real risk free rate of return would prevail if the inflation rate was zero during an investment period. The National Gas Rules (**NGR**) require the Authority utilise a nominal vanilla rate of return in future regulatory decisions, so in this section, the term risk free rate refers to the nominal risk free rate.

Approach

92.   The Authority considers that Commonwealth Government Security (**CGS**) bonds are the best proxy for risk free assets in Australia. Observed yields from these CGS bonds – as reported daily by the Reserve Bank of Australia – will be used for the purpose of estimating a risk free rate of return.

93.   Linear interpolation of the observed yields of CGS bonds will be used to estimate the risk free rate, as it is not common to observe a CGS bond with remaining term to maturity that exactly matches that of the regulatory period.[28]

94.   A 5-year term to maturity will be used to estimate the risk free rate of return for the return on equity and for the return on debt. The risk free rate of return will be set at the start of a regulatory access arrangement period and will be fixed for the length of that period.

95.   An averaging period of 40 trading days – prior to the release of the regulatory decision – will be adopted for the purpose of determining the risk free rate of return to be used in the estimate of the return on equity and the return on debt for the subsequent 5-year regulatory period.

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[28]   In the linear interpolation approach, two bonds are selected with terms to maturity that fall on either side of the term of the regulatory period. The dates on these bonds are referred to as the 'straddle' dates. Linear interpolation estimates the yields on the regulatory period term by assuming a linear increase in yields between the straddle dates on the two bonds observed.

8   Benchmark Credit Rating

96.   The benchmark credit rating is a key input for estimating the Debt Risk Premium (**DRP)**. The credit rating is defined as the forward-looking opinion provided by a ratings agency of an entity's credit risk. Credit ratings provide a broad classification of a firm's probability of defaulting on its debt obligations. As a consequence, credit ratings represent the risk present in holding a debt instrument.

97.   As a general rule, the DRP is higher when the credit rating is lower, and vice versa. This is because lenders require increased compensation before they commit funds to the debt issuer with a lower credit rating. A lower credit rating can be associated with the higher risk of default which leads to the higher DRP.

Approach

98.   The Authority considers that a credit rating based on a benchmark sample of Australian utilities subject to similar risk as the benchmark efficient entity is appropriate and relevant for the purpose of determining the benchmark efficient entity's credit risk.

99.   The Authority is of the view that the list of Australian rated utilities is an appropriate starting point in which the benchmark sample can be formed. The list is reported by Standard & Poor's in its industry report card. Companies included in the benchmark sample to determine the credit rating for the benchmark efficient entity should satisfy two conditions. *First*, the company must be a network service provider in the gas and/or electricity industry in Australia. *Second*, its credit rating must be issued by an international rating agency such as Standard and Poor's or Moody's and publicly available.

100. The Authority's analysis indicated that gas businesses in Australia generally have lower credit ratings in comparison with electricity businesses in Australia.   The Authority's analysis also shows that the credit rating for Australian gas businesses is within the BBB band. As a consequence, for the purpose of these guidelines, the benchmark credit rating is assumed to encompass the BBB-/BBB/BBB+ credit band.

9   Debt risk premium

101. The focus of this section is the Authority's approach to the estimate of the debt risk premium. The debt risk premium is the margin above the risk free rate of return, required to compensate holders of debt securities for the risk in providing debt finance. The debt risk premium compensates holders of debt securities for the possibility of default by the issuer.

Approach

102. The Authority is of the view that it is appropriate to use the bond-yield approach together with the joint-weighting mechanism to estimate the debt risk premium. The debt risk premium derived from the bond-yield approach will be based on the observed yields of relevant Australian corporate bonds, taken from Bloomberg, that qualify for inclusion in the benchmark sample.

103. The Authority will use the Bloomberg data service exclusively in order to construct the benchmark sample. Under the bond-yield approach, the following criteria apply in order to select bonds to be included in the benchmark sample:[29]

- the credit rating of each bond must match that of the benchmark efficient entity, as rated by Standard & Poor's;

- the remaining time to maturity must be two years or longer;

- the bonds must be issued in Australia by Australian entities and denominated in Australian dollars;

- fixed bonds and floating bonds are eligible for inclusion;

- both Bullet bonds and bonds with Callable/ Putable redemptions are eligible for inclusion; and

- there are at least 10 yield observations over the required 40 day averaging period.

104. The debt risk premium is derived based on the observed yields obtained from the bonds in the benchmark sample. The debt risk premium for each bond is calculated by subtracting the relevant risk free rate that has the same maturity as that of the bond.

105. A weighted average debt risk premium is then calculated by weighting each estimated debt risk premium for each bond in the benchmark sample by its "joint-weight". The joint-weight for each bond is calculated by multiplying the bond's term to maturity by its amount at issuance, then dividing by the sum of all bonds in the sample's terms to maturity times their amount at issuance. The debt risk premium for the benchmark efficient entity is then calculated as the weighted average debt risk premium of each bond in the benchmark sample by using its joint weight.

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[29] Economic Regulation Authority, *Discussion Paper – Measuring the Debt Risk Premium: A Bond-Yield Approach*, December 2010 p. 11.

10   Return on equity

106.   National Gas Rule (**NGR**) 87(7) states that regulators, in estimating the return on equity, must have regard to the prevailing conditions in the market for equity funds. At the same time, under NGR 87(5), regard must be had for relevant estimation methods, financial models, market data and other evidence. Overarching these requirements, under NGR 87(3), the regulator is required to achieve the allowed rate of return objective.

107.   There are no readily observable proxies for the expected return on equity. Estimating a forward-looking return on equity – sufficient to provide regulated firms with reasonable opportunity to recoup their prevailing equity financing costs – requires the use of models. Generally, these models seek to explain the required return on equity through a relationship with some 'portfolio' of risk factors, or else in terms of the present value of the expected stream of future cash flows.

108.   In this section, the Authority sets out its approach to estimating the return on equity, in terms of the requirements of the National Gas Law (**NGL**) and National Gas Rules.

Approach

Models of the return on equity

109.   The model used by Australian regulators for quantifying the return on equity and associated risk to date has been the Sharpe Lintner Capital Asset Pricing Model (**CAPM**). The previous NGR specifically referred to this variant of the model as being an example of a 'well accepted' financial model.[30]

110.   Other asset pricing models in the CAPM family build on the standard Sharpe-Lintner CAPM, and include:

- the Black and Empirical CAPM;
- the Consumption CAPM; and
- the Inter-temporal CAPM.

111.   There is also an extensive range of other models which seek to estimate the return on equity, including:

- the Arbitrage Pricing Theory family of models;
- the Fama-French Three-Factor Model and its extensions;
- the Dividend Growth Model family (DGM – both single-stage and multi-stage);
- the Residual Income Model;
- Market Risk Premium approaches; and
- the Build-up Method.

112.   In addition, there are approaches that are not based on modelling per se, but rather on available data from a range of comparators or analysts' reports. These include:

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[30]   Other regulators, such as Ofgem in the United Kingdom and the New Zealand Commerce Commission have adopted the Sharpe-Lintner CAPM as the prime means to estimate the return on equity. Ofgem, for example, elected in 2010 to continue the use of the Sharpe Lintner CAPM under its 'RIIO' regime as the main model for determining the return on equity (Ofgem 2010, *Regulating energy networks for the future: RPI-X@20 Recommendations: Implementing Sustainable Network Regulation*, www.ofgem.gov.uk, p. 130).

- estimated market returns on comparable businesses;
- brokers' reports and the Dividend Yield approach.

113. The Authority has reviewed these asset pricing approaches in terms of their ability to contribute to the achievement of the allowed rate of return objective. The conclusion from that assessment leads the Authority to consider that only the Sharpe Lintner CAPM model is relevant for informing the Authority's estimation of the prevailing return on equity for the regulated firm, at the current time.

114. However, the Authority proposes to give weight to relevant outputs from the DGM when estimating the market risk premium (**MRP**) for input to the Sharpe Lintner CAPM. In particular, estimates from the DGM will be used to inform the range of the MRP, which will be then used as input to the Sharpe Lintner CAPM.

115. Other models and approaches are considered to be not relevant within the Australian context at the current time, at least without some new developments in terms of the theoretical foundations or in the empirical evidence.

A five step approach to estimating the return on equity

116. The Authority will determine a single point estimate for the return on equity.

117. Where there are multiple relevant estimation methods, financial models, market data and other evidence informing the return on equity, then the Authority will combine these to form a range. The Authority recognises that it may be appropriate in some circumstances to adopt a formal weighting approach for each estimation method or model, for the purpose of determining the range.

118. Where the return on equity is derived as a range, then the Authority will utilise other relevant information, and its judgment, to determine a single point estimate for the return on equity.

119. Similarly, parameter estimates contributing to the relevant estimation methods or models may initially be estimated as a range, or derived directly as a point estimate. Where parameter estimates are derived as a range, the Authority will then utilise other relevant information and its judgment to determine a single point estimate for input to relevant estimation methods and models.

120. The Authority will adopt a five step approach for estimating the return on equity. The five steps are summarised in Figure 1. This approach will allow the Authority to have regard to a wide range of material, taking account of relevant models for the return on equity, as well as a range of other relevant information. The Authority will give weight to each piece of information according to its merits at the time of each determination. This will enable it to provide a transparent and clear decision that meets the allowed rate of return objective.

Figure 1   Proposed approach to estimating the return on equity[31]

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┌─────────────────────────────────────────────────────────────┐
│ 1. Identify relevant material and its role in the estimate   │
│ a) Identify relevant estimation methods, models, data and    │
│    other evidence                                            │
│ b) Evaluate role of relevant material in determining the     │
│    return on equity                                          │
└─────────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────────┐
│ 2. Identify parameter values                                 │
│ a) Estimate ranges based on relevant material                │
│ b) Determine point estimates taking into account all         │
│    relevant material                                         │
│ c) Adjust for any material differences in risk if deemed     │
│    necessary                                                 │
└─────────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────────┐
│ 3. Estimate return on equity                                 │
│ a) Run models for the return on equity using parameter       │
│    point estimates                                           │
│ b) Weight model results to determine single point estimate   │
│    of the return on equity                                   │
└─────────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────────┐
│ 4. Conduct cross checks                                      │
│ a) Consider cross checks of parameters, review if necessary  │
│ b) Consider cross checks of overall return on equity,        │
│    review if necessary                                       │
│ c) Review whether the return on equity estimate is likely    │
│    to achieve the allowed rate of return objective           │
└─────────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────────┐
│ 5. Determine the return on equity                            │
│ a) Finalise the return on equity taking into account all     │
│    relevant information ensuring that it meets the allowed    │
│    rate of return objective                                  │
└─────────────────────────────────────────────────────────────┘
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[31] The Authority considers that the term:

- 'approach' refers to the overall framework or method for estimating the return on equity, which combines the relevant estimation methods, financial models, market data and other evidence;
- 'estimation material' refers to any of the relevant estimation methods, financial models, market data and other evidence that contribute the 'approach';
- 'estimation method' relates primarily to the estimation of the parameters of financial models, or to the technique employed within that model to deliver an output.

11 Market Risk Premium

121. The market risk premium (**MRP**) is the required return, over and above the risk free rate of return, on a fully diversified portfolio of assets. The MRP, a key component of the estimate of the required rate of return on equity, compensates an investor for the systematic risk of investing in the "market" portfolio. Total risk for any business includes systematic risk and non-systematic risk.   Systematic risk cannot be diversified away by investors because this type of risk affects all firms in the market.

122. The required rate of return on equity for future regulatory periods is a forward-looking concept. It is the expected return that is of importance when pricing capital in order to efficiently attract investment. While estimates of the cost of debt can be obtained by observing debt instruments, the financial markets do not provide a directly observable proxy for the cost of equity for either individual firms or the market as a whole.

123. In Section 10, the Authority set out the framework which it will use for combining relevant material when determining the return on equity.[32] Section 10 also identifies those points at which the Authority considers it may need to apply its judgment to ensure that the allowed rate of return objective is achieved.

124. The National Gas Rule (**NGR**) 87(5) states that regulators must have regard to relevant estimation methods, financial models, market data and other evidence when determining the return on equity. The Authority concludes in Section 10 that the Sharpe-Lintner Capital Asset Pricing Model (**CAPM**) is the only model which is relevant for informing the Authority's estimate of the return on equity at the current time. The MRP is a key input to the Sharpe-Lintner CAPM.

125. This section considers issues related to the estimate of the market risk premium. In particular, it establishes the range for the forward looking estimate of the MRP. The method for determining the point estimate of the resulting range of the MRP – for use in the Sharpe-Lintner CAPM – is set out in section 10.

Approach

126. The Authority considers that any estimate of the MRP is conditional on the relationship that exists between the MRP and the risk free rate. The Authority notes three possible theoretical relationships that exist: (i) a negative relationship (ii) no relationship and (iii) a positive relationship.

127. The Authority has considered its own empirical analysis, in addition to the advice of academics, and concluded that no clear relationship exists between the MRP and the risk free rate.

128. The Authority's theoretical and empirical analysis of the MRP also has concluded:

- Historical averages of market risk premium are relevant for informing the future MRP.

- The return on equity is likely to be more stable than the MRP – therefore there is cause to consider varying the MRP across regulatory decisions.

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[32] National Gas Rules 87(14) requires that the rate of return guidelines set out the methodologies which the ERA proposes to use in estimating the allowed rate of return, as well as the estimation methods, financial models, market data and other evidence that the ERA proposes to take into account.

- There does not appear to be a consistent relationship between the risk free rate and the MRP – statistical analysis does not provide assistance in considering how any variation in the MRP should be made.

- There does not appear to be a flight to quality during times of crisis in Australia – therefore this does not necessarily indicate that a substantial fall in the risk free rate is associated with an increase in the MRP.

- An adjustment to the MRP as a result of the risk free rate being at a low level is not necessary.

- The dividend growth model (**DGM**) provides information that can be used to inform the MRP.

129. The Authority notes that the historical risk premium approach implicitly assumes no relationship between the MRP and risk free rate, whilst the DGM implicitly assumes a negative relationship. As a consequence the Authority considers that both historical averages and the DGM can be used to estimate a range for the MRP.

130. Once a range is established, other forward looking information outlined in Appendix 29 – Other relevant material will be used to inform the selection of a point estimate within the range.

131. Given the range of relevant estimates available at this point in time, the Authority is of the view that a range of 5.0 per cent to 7.5 per cent for the MRP is appropriate for the rate of return guidelines.

12   Equity beta

132. Under the capital asset pricing model (**CAPM**) model, the total risk of an asset is divided into systematic and non-systematic risk. Systematic risk is a function of broad macroeconomic factors (such as economic growth rates) that affect all assets and cannot be eliminated by diversification of the businesses asset portfolio.

133. The key insight of the CAPM is that the contribution of an asset to the systematic risk of a portfolio of assets is the correct measure of the asset's risk (known as beta risk) and the only systematic determinant of the asset's return, over and above the return on a risk free asset.

134. In contrast, non-systematic risk relates to the attributes of a particular asset. The CAPM assumes this risk can be managed by portfolio diversification. Therefore, the investor in an asset does not require compensation for this risk.

135. Formally, there are three main components of the Sharpe Lintner CAPM for measuring the return on an asset: (i) the market risk premium (**MRP**), which is the return on the market portfolio in excess of the risk free rate of return, (ii) the beta risk β, which correlates the return on the specific asset, in excess of the risk free rate of return, to the rise and fall of the return on the market portfolio and iii) the risk free rate of return. The most common formulation of the CAPM directly estimates the required return on the equity share of an asset as a linear function of the risk free rate and a component to reflect the risk premium that investors would require over the risk free rate:

$$R_e = R_f + \beta_e \left(R_m - R_f \right) \qquad (4)$$

where

R_e is the required rate of return on equity;

R_f is the risk free rate;

β_e is the equity beta that describes how a particular portfolio i will follow the market which is defined as;

$\beta_e = \mathrm{cov}\left(r_i, r_M \right) / \mathrm{var}\left(r_M \right)$; and

$\left(R_m - R_f \right)$ is the market risk premium, MRP.

136. In the CAPM, the equity beta value is a scaling factor applied to the market risk premium, to reflect the relative risk for the return to equity of the firm in question. Two types of risks are generally considered to determine a value of equity beta for a particular firm: (i) the type of business, and associated capital assets, that the firm operates; and (ii) the amount of financial leverage (gearing) employed by the firm.

Approach

137. The Authority considers that empirical evidence must be used to inform its judgment for equity beta, as no a prior expectation exists for the equity beta of regulated gas distribution and transmission networks. The Authority considers the methodology

outlined by Henry is fit for purpose for these rates of return guidelines.[33] To this end, the Authority has conducted its own analysis primarily based on this advice.

138.   The Authority considers that it is inappropriate to include overseas businesses in the sample which is used to estimate the equity beta. Such an inclusion is arbitrary and the benefits of a larger sample due to this inclusion may be outweighed by the distortions of a larger sample with non comparable businesses.

139.   The Authority notes that, given the substantial variation and imprecision inherent in equity beta estimation, empirical evidence concerning a suitable range will be needed to inform its decision. The Authority will take into account the outcomes from a range of statistical techniques, including bootstrap analysis,[34] in order to inform the overall observed range of the equity beta. The Authority's approach is transparent and the findings can be replicated by interested parties.

140.   Based on its analysis, the Authority considers that it is appropriate, at this time, to adopt a range for equity beta from 0.50 to 0.70.

141.   The Authority will exercise judgement in order to determine the point estimate of the beta, with a view to ensuring the estimate best reflects the systematic risk associated the benchmark efficient entity.   The Authority considers that relevant empirical evidence supports a view that there is some downward bias in equity beta estimates that are less than one, and upward bias in equity beta estimates that are greater than one. The Authority intends to undertake more work to quantify the extent of this potential bias. This work would then inform the degree to which the Authority might adjust up the point estimate of the equity beta within the estimated range, so as to account for the potential beta bias.

142.   The Authority is of the view that the approach adopted for equity beta estimation is robust and fit for purpose. This view is based on the considerations of various empirical studies and other assessments from the information before the Authority. As a result, the Authority considers the methodologies adopted in this section meet the allowed rate of return objective.

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[33]   Henry, O (2009) "Estimation Beta", Advice Submitted to the Australian Competition and Consumer Commission.

[34]   *Bootstrapping is a statistical methodology for ascertaining the accuracy of an estimated quantity by re-sampling the data at hand.*

13   Debt and equity raising costs

143. Debt and equity raising costs are the administrative costs and other charges incurred by businesses in the process of raising or refinancing debt or equity. This section sets out the Authority's considerations with regard to these costs.

Approach

Debt raising costs

144. The Authority is of the view that debt raising costs should be incorporated as a component in the rate of return on debt. However, these debt raising costs should only include the direct cost components recommended by the Allen Consulting Group **(ACG)** in its 2004 report to the ACCC and accepted by Australian regulators since then. These costs will be recompensed in proportion to the average annual issuance, and will cover: (i) gross underwriting fees; (ii) legal and roadshow fees; (iii) company credit rating fees; (iv) issue credit rating fees; (v) registry fees; and (vi) paying fees.

145. The Authority considers that indirect costs are not appropriate to be included in the estimate of debt raising costs and will not be compensated.

146. The Authority considers that the estimate of 12.5 basis points per annum is currently the most relevant estimate of debt raising costs for the benchmark efficient entity. The Authority will re-evaluate this position at the time of an access arrangement if relevant new information is provided to it.

147. In addition, the Authority recognises that there is a cost involved with hedging. The Authority considers that an annual swap allowance of 2.5 basis points should be provided to firms on the whole of the debt portfolio to compensate for the cost of conducting hedging for the exposure to movements in the risk free rate. The hedging cost allowance would also be added to the return on debt.

148. In total, 15 basis points per annum allowance will be provided to regulated entities to reflect debt-raising and hedging costs.

Equity raising costs

149. The Authority also considers that an allowance for the transaction costs of raising equity is justified where an adjustment is required to maintain the debt to equity ratio at 60 per cent.

150. The Authority will estimate equity raising costs for regulated businesses as follows:

- retained earnings of 30 per cent of after-tax profits will be available to increase equity at zero cost;

- dividends will be assumed to be paid at the benchmark payout ratio of 70 per cent of after-tax profits, consistent with the payout ratio used in the estimation of gamma;

- 25 per cent of dividends paid out will be treated as being reinvested through Dividend Re-investment Plans, with an equity raising cost allowance of one per cent applied;

- any further required equity is raised at the Seasoned Equity Offering (**SEO**) cost of 3 per cent – with these costs added to the regulated asset base, at the same time and in proportion to the underlying capital expenditure, and depreciated over the life of the assets.

14   Gamma

151.   The Authority is required by the new National Gas Rules (**NGR**) to set out its approach to estimating the value of gamma, a parameter in the post tax revenue model. The gamma parameter takes into account the impact the imputation tax system has on the WACC. The imputation tax system removes the possibility of corporate profits being taxed twice. Prior to the introduction of imputation on 1 July 1987, company profits were taxed once at the corporate level, and again at the dividend recipient level (for example, as personal income tax). Under the Australian imputation tax system, a franking credit is distributed to investors at the time dividends are paid, providing a potential offset to those investors' taxation liabilities. A full imputation tax system for companies was adopted in Australia on 1 July 1987.

152.   Gamma is the parameter in the WACC that takes into account the value generated by the distribution of franking credits to investors. As a general rule, investors will accept a lower required rate of return on an investment that has franking credits compared with an investment that has similar risk and no franking credits. The precise value investors place on franking credits is ambiguous, given that individual investors have differing circumstances (e.g. differential marginal tax rates and eligibility). In addition, the distribution of franking credits by companies differs primarily as a result of differences in shares of profit that are liable for taxation and the proportion of profits paid as dividends. As a consequence of this variability, the precise value of gamma required under the NGR is difficult to identify.

Approach

153.   The Authority considers that it is appropriate to estimate gamma as the product of two components: (i) the payout ratio (F); and (ii) the market value of imputation credits (θ). This can be represented as follows:

$$\gamma = F . \theta \tag{5}$$

154.   The Australian Completion Tribunal has recently adopted a market value of imputation credits of 0.35, together with a payout ratio of 0.70 to produce a gamma estimate of 0.25 in the case of Energex Limited.[35]

155.   The Authority considers that an estimate of the payout ratio of 70 per cent is appropriate based on the empirical evidence currently available. This estimate is consistent with the Tribunal's decision with regard to the value of the payout ratio.

156.   The Authority notes that three methodologies exist for estimating theta; (i) tax statistics, (ii) dividend drop off (**DDO**) studies; and (iii) the simultaneous price methodology. The Authority notes that tax statistics can only provide an upper bound for the value of theta; whilst simultaneous price studies suffer from a lack of relevant data.

157.   The Authority considers that dividend drop-off studies offer a key advantage in that they calculate an observed market value for franking credits. The Authority therefore considers that the dividend drop-off methodology is the most appropriate methodology for estimating theta. However, dividend drop-off studies are known to suffer from a

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[35] Australian Competition Tribunal, Application by Energex Limited (Distribution Ratio (Gamma)) (No 5) [2011] ACompT 9 (12 May 2011), paragraph 42.

variety of estimation issues that result in the estimated value of theta being vulnerable to the dividend sample, parametric form of the regression equation and regression technique used. As a consequence, the Authority is of the view that it is more appropriate to use a range of dividend drop-off studies. Given significant changes to the taxation system in the year 2000/01, the Authority considers it appropriate to use post-2000 studies only.

Table 1   Estimated value of theta from relevant dividend drop-off studies

Author	Year	Data	Theta
SFG[36]	2011/2013	DatAnalysis, 2000 -2010	0 - 0.35
ERA[37]	2013	Bloomberg, 2001 -2012	0.35 – 0.55

Source: Compiled by the Economic Regulation Authority

158. Table 1 outlines that the permissible range for theta suggested by dividend drop off studies the Authority considers relevant. Given the Tribunal decision, the Authority believes that for the purposes of these guidelines the permissible range of theta is 0.35-0.55. Given the payout ratio of 0.70, the Authority is of the view that the estimated range for gamma is 0.25 to 0.39.

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[36] SFG Consulting 2011, Dividend drop-off estimate of theta, Final Report, 21 March.

[37] Vo, D., Gellard, B., Mero, S. (2013) '*Estimating the Market Value of Franking Credits, Empirical Evidence from Australia' Conference Paper*, Australian Conference of Economists 2013.

15   Inflation

159.   Inflation is defined as the rate of change in the general level of prices of goods and services. A nominal rate of return incorporates the 'real' rate of return, as well as a component rate that reflects expectations of inflation.

160.   In line with the requirements of the National Gas Rules, the Authority will utilise a nominal vanilla rate of return for its future decisions.

161.   The size of the inflation component will have an impact on the nominal prices set for gas distribution and transmission networks. To ensure pricing meets the objectives of the National Gas Law and the National Gas Rules, a reliable method for estimating the inflation rate that will prevail over the 5 years of the relevant access arrangement is required.

162.   The resulting estimate of the expected inflation rate will be an input to the nominal modelling of the rate of return, as well as of other components of revenue. In particular, the expected rate of inflation will be required:

• for the roll forward of the regulatory asset base, and for indexing purposes to determine annual depreciation allowances;[38]

• to back out the expected inflation underpinning the nominal building block allowances in the tariff variation mechanism, to allow account for subsequent actual inflation.

163.   The expected rate of inflation will also allow stakeholders to determine the real rates of change in tariffs, as well as the real rate of return, which is an important contributor to the real changes in tariffs.

Approach

164.   The expected inflation rate will be estimated using the Treasury bond implied inflation approach. The approach uses the Fisher equation and the observed yields of 5-year Commonwealth Government Securities (**CGS**) (which reflect a market based estimate of the nominal risk free rate) and 5-year indexed Treasury bonds (which incorporate a market based estimate of a real risk free rate).[39,40]

165.   The Authority will estimate the expected inflation rate consistent with the estimate of the risk free rate by adopting an averaging period of 40 trading days prior to an access arrangement determination.

166.   Linear interpolation will be used to derive the daily point estimates of both the nominal 5-year risk free rate and the real 5-year risk free rate, for use in the Fisher equation.[41]

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[38] This is a requirement to achieve 'economic depreciation' rates in a nominal model. See, for example, the Australian Energy Regulator's Post Tax Revenue Model (Australian Energy Regulator 2010, *Amendment: Electricity transmission network service providers: Post tax revenue model*, www.aer.gov.au).

[39] The formal Fisher equation is: $1+i = (1+r)(1+\pi^e)$

where: i is the nominal interest rate, r is the real interest rate and π^e is the expected inflation rate.

[40] ERA (September 2012) Final Decision, *Proposed Revisions to the Access Arrangement for the Western Power Network*

[41] It is not common to observe a CGS bond with an expiry date that exactly matches that of the regulatory period end. To overcome this, two bonds are selected that fall on either side of the end day of the regulatory period. The dates on these bonds are referred to as the 'straddle' dates. Linear interpolation estimates the yields on

The term of the resulting average expected inflation rate is 5 years, consistent with the length of the access arrangement period.

167. The Authority considers that this approach is appropriate for deriving expected rates of inflation. In this approach, estimates of both the nominal and real risk free rates of return are directly observed from the financial markets, so reflect the market expectation for inflation.

168. However, the Authority is aware that under some circumstances this approach may be problematic. For example, during the recent global financial crisis there were liquidity issues in the Treasury indexed bonds market which significantly increased the potential for bias in the estimate of a real risk free rate. In such circumstances, another approach – such as the RBA's Inflation Forecast approach method – may be preferred.

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the regulatory period end date by assuming a linear increase in yields between the straddle dates on the two bonds observed.