Economic Regulation Authority

2022 gas rate of return instrument review

Discussion paper

December 2021

D241668

Economic Regulation Authority

Level 4, Albert Facey House

469 Wellington Street, Perth WA 6000

Telephone 08 6557 7900

Email info@erawa.com.au

Website www.erawa.com.au

This document can also be made available in alternative formats on request.

National Relay Service TTY: 13 36 77

About this instrument and review

The Economic Regulation Authority is undertaking a review of the gas rate of return instrument.

The expected rate of return on capital provides a business with funds to service the interest on its loans and give a return to shareholders.

The gas instrument is required under the National Gas Law as implemented in Western Australia by the *National Gas Access (WA) Act 2009*. The gas instrument sets out the methods the ERA will use to estimate the allowed rate of return and value of imputation credits for gas transmission and distribution service providers. These regulated gas pipelines include the Dampier to Bunbury Natural Gas Pipeline, the Goldfields Gas Pipeline and the Mid-West and South-West Gas Distribution Systems.

The ERA published its current gas instrument on 18 December 2018.[1]

The ERA is required to complete a review of the gas instrument every four years and its next gas instrument is required to be published by 18 December 2022.

This discussion paper sets out the ERA's working views on the method for calculating the allowed rate of return, and its components, for the 2022 gas rate of return instrument.

The ERA is seeking stakeholder feedback on the gas instrument discussion paper.

The ERA will consider these submissions in the development of its draft 2022 gas instrument, which is expected to be published for further comment mid 2022.

1 ERA, *Final Rate of Return Guidelines (2018)*, December 2018.

Invitation to make submissions

Submissions are due by 4:00 pm WST, 31 January 2021

The ERA invites comment on this paper and encourages all interested parties to provide comment on the matters discussed in this paper and any other issues or concerns not already raised in this paper.

We would prefer to receive your comments via our online submission form https://www.erawa.com.au/consultation

You can also send comments through:

Email: publicsubmissions@erawa.com.au
Post: Level 4, Albert Facey House, 469 Wellington Street, Perth WA 6000

Please note that submissions provided electronically do not need to be provided separately in hard copy.

All submissions will be made available on our website unless arrangements are made in advance between the author and the ERA. This is because it is preferable that all submissions be publicly available to facilitate an informed and transparent consultative process. Parties wishing to submit confidential information are requested to contact us at info@erawa.com.au.

For further information please contact

General Enquiries

Jason Dignard
Ph: 08 6557 7917
info@erawa.com.au

Media Enquiries

Natalie Warnock
Ph: 08 6557 7933 | Mob: 0428 859 826
media@erawa.com.au

Contents

List of appendices

1. Introduction

1. The ERA is responsible for approving third-party access arrangements in Western Australia for services on gas transmission and distribution pipelines. These gas pipelines are currently the Dampier to Bunbury Natural Gas Pipeline, the Goldfields Gas Pipeline and the Mid-West and South-West Gas Distribution Systems. The ERA's responsibilities are established under the National Gas Law (NGL) and National Gas Rules (NGR) as applied in Western Australia.[2]

2. As part of the ERA's regulatory responsibility to determine revenues for gas network service providers, the ERA must set a rate of return to be applied on regulated assets. Investors expect to receive a return above their investment to cover financing costs. The expected rate of return provides a business with funds to service the interest on its loans and give a return to shareholders.

3. The NGL requires the ERA to produce a gas rate of return instrument (gas instrument).[3]

4. The ERA published its current 2018 gas rate of return guidelines on 18 December 2018 (referred to throughout this document as the 2018 gas instrument).

5. When the 2018 gas instrument was published, it was not binding on the ERA and service providers. The ERA or service providers could depart from the guidelines when progressing an access arrangement, provided that an adequate explanation for any proposed deviation from the guidelines was provided.

6. In April 2019, the Western Australian NGL was amended and the 2018 gas instrument became binding on the ERA and service providers.

7. The ERA must review the gas instrument and replace the reviewed instrument within four years of the last gas instrument:[4]

> **30P Review and replacement of instrument**
>
> (1) The [ERA] must -
>
> (a) review each rate of return instrument; and
>
> (b) make a new rate of return instrument under this Division to replace the reviewed instrument
>
> (2) The [ERA] must replace the reviewed instrument by publishing the new instrument on its website on the day that is —
>
> (a) the fourth anniversary of the day the reviewed instrument was published; or
>
> (b) if the day mentioned in paragraph (a) is not a business day—the first business day after that day.

8. The ERA must review the current gas instrument and publish the 2022 gas instrument by 18 December 2022.

---

2 The *National Gas Access (WA) Act 2009* implements the National Gas Access (Western Australia) Law and National Gas Rules for Western Australia. All references to National Gas Law (NGL) and National Gas Rules (NGR) referred to throughout this document are references to the NGL and NGR which apply in Western Australia.

3 NGL, chapter 2, part 1, subdivision 2, cl. 30D.

4 NGL, chapter 2, part 1, subdivision 2, cl. 30P.

9. These reviews provide an opportunity to undertake a comprehensive assessment of approaches for determining the allowed rate of return.

10. The 2022 gas instrument will be required for the next round of gas access arrangements:

- Mid-West and South-West Gas Distribution Systems proposal assessment commences in September 2023 (access period commencement date is 1 January 2025).
- Goldfields Gas Pipeline proposal assessment commences in January 2024 (access period commencement date is 1 January 2025).
- Dampier to Bunbury Natural Gas Pipeline proposal assessment commences in January 2025 (access period commencement date is 1 January 2026).

11. This discussion paper sets out the ERA's positions in the 2018 gas instrument and the ERA's working view on the method for calculating the allowed rate of return on capital for service providers for the 2022 gas instrument. The paper includes working views based on a range of evidence, expert reports and other regulators' practices.

12. During the review process for the gas instrument the ERA will consider a range of information, including stakeholder submissions, academic literature, market data and developments, information arising from the review consultation processes and any other relevant information, to formulate its final positions for the 2022 gas instrument.

13. The ERA therefore encourages all interested parties to provide submissions on the matters discussed in this paper and any other matters or concerns.

14. The ERA will consider the submissions received and subsequently publish a draft 2022 gas rate of return instrument.

1.1 2018 gas instrument

15. The 2018 gas instrument sets out the following process for calculating the rate of return for a service provider:[5]

- The rate of return is calculated according to a nominal vanilla weighted average cost of capital (WACC) formula.
- The assumed capital structure for applying the WACC formula is 55 per cent debt and 45 per cent equity.
- The estimate of the return on debt is based on a risk premium above the risk free rate, plus an additional margin for administrative and hedging costs. The parameters of the return on debt are estimated as follows:
- The risk free rate is based on bank bill swap rates, applying a five-year term, and is fixed for the length of the regulatory period.
- The debt risk premium is based on a 10-year trailing average debt risk premium which will be updated annually throughout the regulatory period. The debt risk premia are calculated according to the revised bond yield approach using a sample of corporate bonds with a BBB+ credit rating and a term of 10 years.

[5] ERA, *Final Rate of Return Guidelines (2018),* December 2018.

- The annual allowance for debt-raising and debt-hedging costs is 0.100 per cent and 0.114 per cent respectively.
- The estimate of the return on equity is calculated by applying the capital asset pricing model. The inputs to this model are estimated as follows:
  - The risk-free rate is estimated based on the yields on five-year Commonwealth Government Securities.
  - An equity beta of 0.7. This is fixed for the period of the 2018 gas instrument.
  - A market risk premium of 6.0 per cent. This is fixed for the period of the 2018 gas instrument.
- The ERA estimates the expected five-year inflation rate using the Treasury bond implied inflation approach.
- The ERA determines gamma through the Monkhouse formula as the product of the distribution rate and utilisation rate. Gamma is estimated at 0.5. This is fixed for the period of the 2018 gas instrument.

1.2 2022 gas rate of return instrument process

16. The 2022 gas instrument review approach is to:
    - Take the 2018 gas instrument as the starting point.
    - Review all rate of return components for possible change.
    - Assess the relative merits of any new evidence, considering any new matters that stakeholders raise as relevant.

17. In this paper, the ERA proposes working views having considered a range of evidence, expert reports and other regulators' practices.

18. This discussion paper forms part of the broader consultation that the ERA is undertaking as part of the preparation of the 2022 gas instrument.

19. The NGL prescribes several consultation requirements that the ERA must fulfil to develop the 2022 gas instrument. These requirements include that the ERA must consider the advice, recommendations or submissions given by:
    - A Consumer Reference Group.
    - An Independent Panel review of the draft gas instrument.
    - Expert evidence.
    - Other persons invited to make written submissions about the proposed draft instrument.

20. The ERA has previously published a paper setting out the engagement process that it intends to undertake for the review. This engagement document did not discuss substantive technical rate of return matters.[6]

[6] ERA, *Engagement process for 2022 gas rate of return instrument,* July 2021.

21. The intent of the Consumer Reference Group is to provide direct and ongoing feedback to the ERA during the review process that represents broad consumer perspectives. The Consumer Reference Group will have the opportunity to make submissions throughout the process.

22. The Independent Panel will review the draft gas instrument and report on whether it is supported by sound reasoning, based on the available information, such that it is capable of promoting achievement of the national gas objective. The main purposes of the Independent Panel process are to give the ERA the benefit of an independent review, and to promote confidence among stakeholders that the ERA's proposed approach for the gas instrument is robust.

23. Throughout the review, the ERA will consider the views of experts, including as part of concurrent expert evidence. Considering expert evidence will assist the ERA to make decisions that result in a gas instrument that will, or is most likely to, contribute to the achievement of the national gas objective.

24. The ERA's draft gas rate of return instrument will be subject to the reviews of:

- the Independent Panel
- the Consumer Reference Group
- all stakeholders.

25. Indicative milestones for the 2022 gas instrument review are shown in Table 1.

Table 1: Milestones for the 2022 gas rate of return instrument review

Milestone	Description of milestone	Date
Engagement process position paper	This paper detailed the process for the 2022 gas instrument review and sought nominations for the bodies that the ERA must establish under the NGL consultation requirements.	July 2021
ERA discussion paper (this paper)	This paper outlines the ERA's working positions on the method for calculating the allowed rate of return for the 2022 gas instrument and invites public submissions.	December 2021
Public submissions on discussion paper	The ERA will receive written submissions in response to the discussion paper.	Submissions close end of January 2022
Concurrent evidence	Concurrent expert evidence will be available.	February 2022
2022 draft gas instrument	The ERA will publish a draft gas rate of return instrument and explanatory information, which will subsequently be reviewed by the Independent Panel.	June 2022
Independent Panel report	The Independent Panel will provide a report, which will be published on the ERA's website, including the panel's assessment of the evidence and reasons supporting the draft 2022 gas instrument.	August 2022
Public submissions on draft gas instrument and Independent Panel report	The ERA will invite public submissions on the draft 2022 gas instrument and the Independent Panel report.	September 2022
Final 2022 gas instrument	The 2022 gas instrument and explanatory statement will be published and will be a binding instrument, applying to all regulatory determinations made while it is in force.	December 2022

2. Regulatory framework

26. The ERA's responsibilities for gas transmission and distribution services are established under the NGL and NGR as applied in Western Australia.

27. The national gas framework provides for a legislated, uniform national framework governing access to monopoly gas infrastructure, and arrangements for price oversight.

28. This chapter sets out the requirements of the NGL and NGR, which establish the regulatory framework for the rate of return decision-making process and for the 2022 gas instrument review.

2.1 The National Gas Law

2.1.1 Rate of return

29. The NGL states that a gas instrument must set out the way to calculate the rate of return and value of imputation credits that will be applied by the ERA in performing or exercising its economic regulatory functions:

> **30D [ERA] to make rate of return instrument**
>
> (1) This section applies if a rate of return on capital or the value of imputation credits is required for performing or exercising an [ERA] economic regulatory function or power.
>
> (2) The [ERA] must make an instrument (a ***rate of return instrument***) stating—
>
> (a) for a rate of return on capital—the way to calculate the rate; and
>
> (b) for the value of imputation credits—the value or the way to calculate the value.

30. The NGL sets out the content of a gas rate of return instrument, stating that the instrument may include matters the ERA considers appropriate:

> **30E Content of rate of return instrument**
>
> (1) If a rate of return instrument states the value of imputation credits, the instrument must state a single value to apply in relation to all covered pipeline service providers.
>
> (2) If a rate of return instrument states a way to calculate the rate of return on capital or the value of imputation credits, the instrument must—
>
> (a) provide for the same methodology to apply in relation to all covered pipeline service providers in calculating the rate or value; and
>
> (b) provide for the methodology to apply automatically without the exercise of any discretion by the [ERA]
>
> **Example for paragraph (b)—**
>
> The instrument cannot include different methodologies or a band of values from which the [ERA] could choose in applying the instrument.

(3) Subject to subsections (1) and (2), the instrument may include other matters the [ERA] considers appropriate.

Example—

Matters to help a covered pipeline service provider calculate a rate of return or the value of imputation credits.

31. The ERA must publish a gas instrument:

30N Publication of rate of return instrument

After making a rate of return instrument, the [ERA] must publish the instrument on its website.

32. Additionally, the NGL requires that the ERA publish explanatory information for a rate of return instrument:

30L Publication of explanatory information

The [ERA] must publish explanatory information for a rate of return instrument on its website when the instrument is published under section 30N.

2.1.2 Objectives under National Gas Law

33. In setting the allowed rate of return, the NGL states that the ERA must have regard to the national gas objective and revenue and pricing principles:

30D [ERA] to make rate of return instrument

…

(3) The [ERA] may make an instrument only if satisfied the instrument will, or is most likely to, contribute to the achievement of the national gas objective to the greatest degree.

(4) Subject to subsection (3), the way to calculate a rate of return on capital must include a weighted average of an allowed return on equity and an allowed return on debt.

(5) In making an instrument, the [ERA] must have regard to—

(a) the revenue and pricing principles; and

(b) other information the [ERA] considers appropriate.

34. The national gas objective 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.

35. The NGL and the national gas objective are 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.

---

7 NGL, chapter 1, part 3, cl. 23.

8 Holloway, P., *Second Reading Speech: National Gas (South Australia) Bill 2008, Parliamentary Debates (SA),* Legislative Council, 30 April 2008.

36. The revenue and pricing principles in the NGL give effect to the national gas objective.[9] The revenue and pricing principles establish that the national gas objective is to be promoted by targeting economically efficient outcomes, through effective incentives.[10] The revenue and pricing principles are detailed in section 24 of the NGL:

> **24—Revenue and pricing principles**
>
> (1) The revenue and pricing principles are the principles set out in subsections (2) to (7).
>
> (2) A service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs in—
>
> (a) providing reference services; and
>
> (b) complying with a regulatory obligation or requirement or making a regulatory payment.
>
> (3) 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.
>
> (4) Regard should be had to the capital base with respect to a pipeline adopted—
>
> (a) in any previous—
>
> (i) full access arrangement decision; or
>
> (ii) decision of a relevant Regulator under section 2 of the Gas Code;
>
> (b) in the [NGR].
>
> (5) A reference tariff should allow for a return commensurate with the regulatory and commercial risks involved in providing the reference service to which that tariff relates.
>
> (6) Regard should be had to the economic costs and risks of the potential for under and over investment by a service provider in a pipeline with which the service provider provides pipeline services.
>
> (7) Regard should be had to the economic costs and risks of the potential for under and over utilisation of a pipeline with which a service provider provides pipeline services.

37. This specification of "effective incentives in order to promote economic efficiency" in the revenue and pricing principles is consistent with an incentive regulation approach.

38. Incentive regulation is the use of rewards and penalties to induce a utility to achieve desired goals where the utility is afforded some discretion in achieving those goals.[11] The regulatory arrangements and associated rate of return framework constitute one form of regulation that has been developed to provide incentives to achieve economic efficiency.

---

9 Holloway, P., *Second Reading Speech: National Gas (South Australia) Bill 2008, Parliamentary Debates (SA),* Legislative Council, 30 April 2008.

10 NGL, chapter 1, part 3, cl. 24.

11 Lewis, T., and Garmon, C., *Fundamentals of Incentive Regulation,* PURC/World Bank International Training Program of Utility Regulation and Strategy, June 1997.

2.2 The National Gas Rules

39. The NGR detail how the rate of return is applied when determining regulated revenues.

40. The rate of return is detailed in section 87 of the NGR:

> **87—Rate of return**
>
> The return on the projected capital base for a service provider for a regulatory year of an access arrangement period for an applicable access arrangement (**$RPCB_t$**) is to be calculated using the following formula:
>
> $RPCB_t = a_t \times v_t$
>
> where:
>
> a_t is the allowed rate of return for the regulatory year; and
>
> v_t is the value, as at the beginning of the regulatory year, of the projected capital base for the regulatory year (as established under rule 78 and subject to rule 82(3)).

41. The estimated cost of corporate income tax is detailed in section 87A of the NGR, including the use of allowed imputation credits:

> **87A—Estimated cost of corporate income tax**
>
> The estimated cost of corporate income tax of a service provider for each regulatory year of an access arrangement period (ETCt) is to be estimated in accordance with the following formula:
>
> $ETCt = (ETIt \times rt)(1 - \gamma)$
>
> where:
>
> ETIt is an estimate of the taxable income for that regulatory year that would be earned by a benchmark efficient entity as a result of the provision of reference services if such an entity, rather than the service provider, operated the business of the service provider;
>
> rt is the expected statutory income tax rate for that regulatory year as determined by the [ERA]; and
>
> γ is the allowed imputation credits for the regulatory year.

42. Section 3 of the NGR defines the allowed imputation credits must be detailed in the gas instrument:

> **3—Interpretation**
>
> In these rules:
>
> …
>
> ***allowed imputation credits*** for a regulatory year of an access arrangement period for an applicable access arrangement means the value of imputation credits stated, or calculated in the way stated, in the applicable rate of return instrument;

2.3 Implications for the ERA

43. To come to any regulatory decision, the ERA will need to determine the regulatory approach that best delivers the requirements of the NGL, NGR, national gas objective, and revenue and pricing principles.

44. To support the long-term interests of consumers, the ERA aims to promote efficient investment in, and operation of, regulated gas pipelines, and the efficient use of gas pipelines.

45. Section 30D(3) of the NGL states that the ERA may make a gas instrument only if it is satisfied that the instrument will, or is most likely to contribute to, the achievement of the national gas objective to the greatest degree. The ERA must also have regard to the revenue and pricing principles and other information the ERA considers appropriate. The revenue and pricing principles give effect to the national gas objective and establish that the national gas objective is to be promoted by targeting economically efficient outcomes, through effective incentives.[12]

46. While the explicit term "benchmark efficient entity" has been removed from the NGR, the ERA considers that the principles of benchmarking and efficiency are central to the national gas objective.

47. It is common regulatory practice to use a benchmark efficient entity to inform the WACC parameters set for a regulated entity. This is consistent with incentive regulation and ensures that a regulator does not compensate a regulated service provider for its actual costs but compensates it as if it were operating and financed efficiently.

48. For the 2022 gas instrument, the ERA intends to select the methods for calculating rate of return parameters that provide an estimate that is consistent with the efficient financing costs of a benchmark efficient entity with a similar degree of risk in the provision of reference services. The best possible estimate of the expected rate of return will promote efficient investment in, and efficient operation and use of, gas networks services in the long-term interests of consumers. The ERA considers that the promotion of the long-term interests of consumers and the efficiency objectives of the national gas objective and the revenue and pricing principles are best achieved through this approach.

49. The ERA will estimate the returns required by investors in view of the risks associated with regulated gas pipelines compared to their other investment opportunities. The appropriate risk compensation is an important part of the rate of return regulatory framework and is important to achieving the ERA's legislative objectives. The ERA considers the degree of risk involved in providing regulated gas pipeline services when estimating the expected rate of return.

50. The ERA will estimate a benchmark expected rate of return that is applied to a benchmark gas network service provider. The ERA does not determine the returns of a specific gas network service provider based on all its individual circumstances.

51. The ERA defines the benchmark efficient entity as a pure-play network service provider 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 gas network services.

52. The revenue and pricing principles require gas network service providers to be provided with a reasonable opportunity to recover at least the efficient costs they incur. 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.[13]

---

12 NGL, chapter 1, part 3, cl. 24.

13 This is consistent with the 'NPV=0', or present value condition. The NPV=0 principle means that the ex-ante expectation is that over the life of an investment the expected cash flow from the investment meets all the operating costs and taxes on the investment, repays capital invested and covers investors' required return on capital invested. This allows the present value of regulatory cash inflows to equal the present value of the cash outflows from the benchmark efficient entity.

53. If the expected rate of return deviates from the market rate of return, then the allowable rates of return will either be too high or too low compared to the market's expected rate of return. This would not promote efficient investment in, and use of, the service provider's gas pipelines. These inefficient outcomes would not be in the long-term interests of consumers.

54. The allowed rate of return must not be set too high because:

- Investors will be overcompensated for the risk involved in supplying capital to service providers compared to other investments.
- Service providers will have an incentive to over-invest in regulated assets.
- Consumers will pay higher prices than is efficient, which may distort downstream and upstream investment decisions.

55. The allowed rate of return must not be set too low because:

- Investors will be undercompensated for the risk involved in supplying capital to service providers compared to other investments.
- Service providers will be discouraged from investing in regulated assets and there may be under-investment.
- Consumers will pay lower prices than is efficient, which may distort downstream and upstream investment decisions.

56. The ERA will aim to determine its best estimate of an efficient rate of return, consistent with the risks involved in providing regulated gas services. This is a best possible rate of return estimate that is neither too high nor too low. The ERA considers that the best approach to estimating the efficient cost of capital is to base estimates of the parameters of the WACC on observations of market data, because market data reflects the aggregate expectations of investors.

57. The ERA considers that this approach supports efficient investments in gas pipelines and the efficient use of gas pipelines, which is consistent with:

- The national gas objective by promoting the efficient investment in, and operation and use of, gas pipelines to the benefit of the long-term interest of consumers.
- The revenue and pricing principles through having regard to:
    - The economic costs and risks of potential under and over investment by a regulated provider.
    - The economic costs and risks of potential under-use and over-use of networks.
    - Allowing for a return commensurate with the regulatory and commercial risks involved in providing regulated services.

2.4 Use of regulatory judgement

58. The national gas framework does not prescribe the method for the estimation of the rate of return, or its various components.

59. The ERA is the decision maker in the gas instrument review process. As an independent regulator, it is the ERA's responsibility to ensure that its decisions are well-reasoned and based on robust consultation.

60. The market cost of capital for gas NSPs related to regulated gas pipeline services cannot be directly observed and must instead be estimated. This creates a degree of uncertainty.

61. Rate of return decisions are made in an environment of uncertainty and therefore the ERA, as a regulator, must exercise judgement when considering evidence.

62. The ERA's decisions must satisfy the relevant law and rules, which state:[14]

> The [ERA] may make an instrument only if satisfied the instrument will, or is most likely to, contribute to the achievement of the national gas objective to the greatest degree.

63. The ERA will therefore apply its regulatory judgement in accordance with the NGL in developing the 2022 gas instrument and its estimates for rate of return parameters. In applying regulatory judgement and making decisions, the ERA will examine a broad range of evidence including financial market data, financial models, investment practices and stakeholder views.

64. The ERA's aim is to set the best possible estimate of an efficient rate of return, consistent with the risks involved in providing regulated gas services.

65. When using its regulatory judgement on rate of return matters the ERA's decisions will also be informed by the following set of guiding principles. The ERA will select rate of return estimation methods that are:

- reflective of economic and finance principles and market information
- fit for purpose
- transparent
- implementable and replicable
- sufficiently flexible as to allow for changing market conditions.

66. These guiding principles provide a framework through which the ERA is able to inform its regulatory judgement of the evidence before it.

67. The ERA considers that the rate of return is more likely to achieve the national gas objective and revenue and pricing principles when decisions are informed by these principles.

[14] NGL, chapter 2, part 1, division 1A, subdivision 2.

68. The ERA's reasoning in the draft gas rate of return instrument will be subject to the reviews of:

- the Independent Panel
- the Consumer Reference Group
- all stakeholders.

69. The Independent Panel will review the draft gas instrument and report on whether it is supported by sound reasoning based on the available information such that it is capable of promoting achievement of the national gas objective.

70. When finalised, the gas rate of return instrument is a binding instrument on the ERA and gas network service providers. The binding gas rate of return instrument will set out how the rate of return is automatically applied in each regulatory determination, without the exercise of any discretion.

3. List of questions for the 2022 gas rate of return instrument

71. The discussion paper details the ERA's working views on the method for calculating the allowed rate of return, and its components, for the 2022 gas rate of return instrument.

72. During the review process the ERA will consider a range of information, including stakeholder submissions, academic literature, market data and developments, information arising from the review consultation processes, reviews by consumer and technical groups, and any other relevant information, to formulate its final positions for the 2022 gas instrument. The ERA therefore encourages submissions from stakeholders on any matters related to the rate of return, including but not limited to the matters discussed in this paper.

73. The paper asks questions on specific WACC parameters that may be subject to change to seek views on the appropriate approach for those parameters.

74. The ERA considers that stakeholder views and responses to questions related to some of these topics will be particularly pertinent given market developments and developments in relevant literature since the 2018 gas instrument.

75. Table 2 shows a full list of the questions asked in this paper. Submissions are also welcome on relevant matters not covered by these questions.

Table 2: List of questions for the 2022 gas rate of return discussion paper

Question	
1	Do you agree with the use of a five-year term of estimates of the rate of return? If not, please explain why and your alternative approach.
2	Do you agree with the standardised averaging period process? If not, please explain why and your alternative approach.
3	Do you support the use of a gearing level of 55 per cent for the 2022 gas instrument? If not, please explain why and your alternative approach.
4	When determining gearing do you support the ERA adjusting debt and equity to recognise hybrid securities and what is a suitable method for allocating hybrid securities between debt and equity? If not, please explain why and your alternative approach.
5	Do you support the use of a hybrid trailing average approach for the cost of debt estimation? If not, please explain why and provide details of your alternative approach, including transitionary arrangements.
6	Do you support the use of a benchmark credit rating of BBB+ for the 2022 gas instrument? If not, please explain why and your alternative approach.
7	Do you support the use of the revised bond yield approach for estimating the debt risk premium? If not, please explain why and your alternative approach.
8	When estimating the return on equity do you support the use of Commonwealth Government bonds as the risk free asset? If not, please explain why and your alternative approach.

Question	
9	When estimating the historical market risk premium do you support the use of sampling periods post-1958? If not, please explain why and your alternative approach.
10	When estimating the historical market premium do you support expanding the sampling periods to include a new period of 2000 to current? If not, please explain why and your alternative approach.
11	When estimating the historical market premium do you support the approach to only consider the Brailsford, Handley and Maheswaran (BHM) dataset? If not, please explain why and your alternative approach.
12	When estimating the historical market premium do you support the approach to calculate the historic market risk premium through the average of the arithmetic and geometric means? If not, please explain why and your alternative approach.
13	When estimating the market risk premium do you support the current approach of estimating and considering the market risk premium and the risk free rate independently from one another? If not, please explain why and your alternative approach. Specifically, the ERA is interested in: • The empirical relationship (magnitude and direction) between the *ex ante* market risk premium and the *ex ante* risk free rate in Australia and the conceptual logic underpinning such a relationship. • Whether the relationship is sufficiently stable and persistent (that is, not volatile and transitory) on an *ex ante* basis. • Ways in which the relationship can be implemented to estimate the market risk premium in a manner suitable for regulatory purposes.
14	Do you support the continued use of domestic energy networks to estimate equity beta? If not, please explain why and your alternative approach.
15	Do you support the use of a sample of domestic and international comparators to estimate equity beta? If not, please explain why and your alternative approach.
16	If an international sample is to be used for estimating equity beta, which jurisdictions and companies could be considered as part of the sample?
17	If an international sample is to be used for estimating equity beta, how should these international estimates be incorporated into the equity beta estimation method?
18	When considering equity beta should the ERA consider shocks such as COVID-19 and takeover announcements? If so, please explain why and how these events can be accounted for.
19	Do you support the ERA's general approach and simplifications for estimating equity beta (regardless of any potential changes to the sample firms)? If not, please explain why and your alternative approach. Specifically, the ERA is interested in views on the following aspects of the method applied to estimate equity beta in this paper: • Use of a 5-year estimation window with weekly returns. • Use of the Bloomberg total return index for individual stocks and market indices. • Use of the Ordinary Least Squares estimator, with the Least Absolute Deviations method as a robust estimator.

Question	
20	When estimating the expected rate of inflation do you support the use of Treasury bond implied inflation approach? If not, please explain why and your alternative approach.

4. The rate of return framework

76. The rate of return on a service provider's capital base provides a return on the capital invested in the business.

77. The form of the rate of return sets out how the ERA will estimate the rate of return.

78. The NGL states that the rate of return must include a weighted average of an allowed return on equity and an allowed return on debt:

> 30D [ERA] to make rate of return instrument
>
> …
>
> (3) The [ERA] may make an instrument only if satisfied the instrument will, or is most likely to, contribute to the achievement of the national gas objective to the greatest degree.
>
> (4) Subject to subsection (3), the way to calculate a rate of return on capital must include a weighted average of an allowed return on equity and an allowed return on debt.

79. The national gas framework sets out that a building block approach is used that provides an allowance for taxes.[15]

4.1 2018 position

80. The 2018 gas instrument applies a nominal vanilla WACC to develop the rate of return for the benchmark efficient entity.

81. A vanilla WACC does not include any adjustment for tax effects, such as the effect of imputation credits on the rate of return. The effect of tax on the returns must be accounted for separately, as an explicit deduction from the relevant cash flows.

82. The nominal vanilla WACC provides for a simple weighted average of the nominal post-tax return on equity and the nominal return on debt.

83. The vanilla form of the WACC adopted was expressed as:[16]

$$WACC = E(r_e)\frac{E}{V} + E(r_d)\frac{D}{V} \qquad \text{(equation 1)}$$

where:

$E(r_e)$ was the expected return on equity

$E(r_d)$ was the expected return on debt

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

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

[15] NGR version 59, 87(A).

[16] ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, p. 28.

84. The form of the WACC adopted in the 2018 gas instrument fulfilled the requirements of the NGR at the time the 2018 gas instrument was drafted, which required the ERA to adopt a nominal vanilla WACC.[17]

4.2 Developments since 2018 instrument

85. As part of the legislative review of the national gas framework, amendments removed the explicit requirement in the NGR that the allowed rate of return was to be determined on a nominal vanilla basis consistent with the estimate of the value of imputation credits.

86. However, the nominal vanilla WACC approach has continued to be used by Australian regulators.

4.3 2022 initial position

87. The ERA's working view is that the 2022 gas instrument should maintain the use of a nominal vanilla WACC. This approach is:

- transparent
- consistent with the estimation of gamma
- consistent with the ERA's long-standing approach.

[17] NGR version 41, 87(4). The requirement ceased to apply after 31 January 2019, when version 42 of the NGR became effective. The current NGR do not have this requirement.

5. The term of the WACC

88. When determining a rate of return, it is necessary to consider the term of the estimate of the rate of return. For example, is the rate of return to apply for a period of one year or a period of 20 years?

89. In a business context, the term of the required rate of return on an asset relates to the expected investment time horizon. In a regulatory context, the term of the allowed rate of return is related to the time horizon to which the allowance applies, which for gas network service providers is the length of the access arrangement period. However, some different views exist on the appropriate time horizons for estimating the parameters of the weighted average cost of capital (WACC) for regulatory purposes.

90. This chapter outlines the ERA's working view on the approach to the term of the WACC that should be applied in the 2022 gas instrument.

5.1 2018 position

91. The 2018 gas instrument applies a term of the estimates for the rate of return that is, as far as possible, consistent with the term of the regulatory period.[18] Accordingly, as the regulatory period for the ERA's gas pipeline decisions is five years, the term of its estimates for the rate of return will generally be five years.[19, 20]

92. The ERA considered that, in a regulated environment in which output prices are set, the present value of the revenue forecast to be earned from an asset (plus or minus any efficiency rewards or penalties) must be equal to the initial investment to provide an opportunity for an efficient entity to recover total costs. If no more than, or no less than, the total costs are forecast to be recovered, in discounted terms, then the net present value is zero (known as NPV=0, or the present value principle).[21]

93. The NPV=0 principle was central to the ERA's approach to setting the rate of return for the 2018 instrument.

94. The ERA was of the view that setting the terms of the components for the rate of return to match, as far as possible, the regulatory control period – which is generally five years – will satisfy the present value principle, which is important for providing economically efficient investment signals. This position was supported by studies by Dr Martin Lally and Kevin Davis.[22]

18 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, p. 29.

19 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 12.

20 While the ERA set a five-year term across the WACC and its parameters, the cost of debt did recognise that businesses do enter into longer term debt on a staggered basis.

21 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, p. 30.

22 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, pp. 30-34.

95. The ERA's support for term matching helped inform some of its consideration of its approaches to estimating the return on equity and the return on debt.[23] The ERA considered that the following approaches best approximated the NPV=0 principle consistent with the national gas objective and revenue and pricing principles in the long-term interest of consumers:

- A return on equity calculated on a five-year term best approximated the NPV=0 principle. The ERA considered that the valuation problem for a regulator was to set the return on equity for the regulatory period, and that this rate is reset every five years.
- A return on debt calculated using a hybrid trailing average approach. Under the hybrid trailing average approach:
    - The benchmark entity enters into the assumed benchmark efficient debt strategy. This strategy was assumed to be a staggered portfolio of 10-year fixed-rate debt with 10 per cent refinanced each year.
    - The benchmark entity uses derivative arrangements to adjust the efficient debt portfolio to lock in five-year bank bill swaps rates. This arrangement fixes bank bill swap rates at the start of the regulatory period for the term of the regulatory period.
    - A 10-year trailing average debt risk premium is used to reflect the staggered portfolio of 10-year fixed-rate debt and recognises that the credit risk of debt issuances cannot be hedged.
    - The 10-year trailing average debt risk premium is updated annually through the tariff variation mechanism, which accommodates annual changes in the credit risk of new debt issuances.

96. The ERA's 2018 gas instrument estimated the expected inflation rate using a term that matched the regulatory period. The ERA considered that this best approximated the NPV=0 principle consistent with the national gas objective and revenue and pricing principles in the long-term interest of consumers.

5.2 Developments since 2018 instrument

97. In 2020, the Australian Energy Regulator (AER) conducted a review of inflation and decided to match its estimate of expected inflation to the length of the regulatory period.[24] The AER had previously been using a 10-year term for expected inflation.

98. The AER's position on inflation was informed by advice from Dr Lally. Dr Lally advised that the term for expected inflation should match the length of the regulatory period consistent with the NPV=0 principle.[25] Using an inflation term that is not the regulatory cycle does not correctly align with investor's expected inflation rates for the years within the regulatory cycle, and therefore there will be a present value error.[26] This advice also noted that the term of the rate of return should match the length of the regulatory period.[27]

---

23 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, pp. 34-35.

24 AER, *Final position: Regulatory treatment of inflation,* December 2020, p. 35.

25 Dr Lally, M., *Review of the AER's inflation forecasting methodology*, July 2020, p. 3.

26 Dr Lally, M., *Review of the AER's inflation forecasting methodology*, July 2020, pp. 4-9.

27 Dr Lally, M., *Review of the AER's inflation forecasting methodology*, July 2020, p. 6.

99. Given the change to the term of expected inflation, the AER considered that it should review the term of the rate of return to check whether its current approach remained appropriate.[28]

100. In 2020 the AER commenced a review of the term of the rate of return and in September 2021 published a final working paper.[29]

101. In the final working paper, the AER decided to leave the term of equity and term of debt open for further consideration as part of its concurrent evidence sessions in 2022.[30] In the paper, the AER:

- Stated that terms for the return on equity, return on debt and expected inflation may be different and should be independently assessed. In considering the choice of the term for equity, debt and expected inflation common principles should be used, in particular the NPV=0 principle.[31]
- Explored possible options for the term for equity included matching to the regulatory period (typically five years) or matching to the underlying asset lives (typically 10 years is used to reflect the long asset lives).[32] Consistent with the AER's inflation review, the same NPV=0 principle when applied to the term of the return on equity would support matching to the length of the regulatory period.[33]
- Examined the form of return on debt and chose to maintain its trailing average approach.[34]

102. The AER engaged Dr Martin Lally as part of its review of the appropriate term for the rate of return.[35] Dr Lally's advice included the following:

- The valuation problem facing a regulator with a five-year regulatory cycle is different from that of valuing an unregulated business.[36]
- The terms for the return of equity, return on debt and expected inflation do not need to align and these terms can be determined separately by applying the NPV=0 principle.[37]
- The appropriate term for expected inflation should be the regulatory cycle.[38]

---

28 AER, *Final position: Regulatory treatment of inflation,* December 2020, p. 23.

29 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021.

30 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, p. 17.

31 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, pp. 43-44.

32 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, pp. 58-60.

33 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, p. 18.

34 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, p. 60.

35 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021.

36 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 21.

37 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, pp. 3-4.

38 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 52.

- In respect of the cost of equity, the NPV=0 principle implies that the term must match the regulatory cycle. The valuation problem for a regulator is like that for a business terminating in five years' time, or a floating rate bond whose coupon rate is reset every five years.[39]
- In respect to the cost of debt the appropriate debt term is dependent on the form of the return on debt. The NPV=0 principle requires that the allowed cost of debt match that incurred by the benchmark efficient firm. Dr Lally considered that for an established firm both the trailing average approach and hybrid trailing average approach satisfy the NPV=0 principle.[40]
- With respect to the hybrid trailing average approach, the appropriate term for the allowed debt risk premium would be historical and equal to the term for which the benchmark efficient entity borrows, whilst the appropriate term for the allowed risk free rate within the cost of debt would be the future term of the regulatory period.[41]

5.3 2022 initial position

103. The ERA's working view is to maintain the use of a five-year term for estimates of the rate of return, and as far as possible, to be consistent with the regulatory period.

104. Dr Lally's most recent advice supports the ERA's approach to the term of the rate of return detailed in the 2018 gas instrument.

105. The valuation problem confronting a regulator with a five-year regulatory period is different from that of valuing an unregulated business. The ERA is concerned with estimating efficient costs attributable to a single regulatory period rather than over the entire asset life. This is because the ERA resets the revenue allowance every regulatory period.

106. The ERA considers that matching the regulatory period, as far as possible, best approximates the NPV=0 principle and delivers efficient financing costs consistent with the national gas objective and revenue and pricing principles in the long-term interest of consumers.

107. The ERA's consideration of the approaches to the return on equity, return on debt and expected inflation are detailed separately later in this document.

Question 1

Do you agree with the use of a five-year term of estimates of the rate of return? If not, please explain why and your alternative approach.

[39] Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 52.

[40] Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 53.

[41] Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 40.

6. Averaging period process

108. Regulated gas network service providers are required to periodically submit access arrangements to the ERA for approval, typically every five years.

109. To establish the method for estimating the rate of return, the ERA must observe the market returns on proxy assets that are used to estimate the following parameters:

- the risk free rate, which is an input into calculating the return on equity
- the base rate, which is an input into calculating the return on debt
- the debt risk premium, which is an input into calculating the return on debt
- the expected inflation forecast.

110. During the access arrangement process, the gas network service providers must propose averaging periods within a nomination window.

- Averaging periods are used when calculating their returns on equity (the risk free component) and returns on debt (the base rate and debt risk premium components).
- The nomination window set out in the gas instrument is the period from which a gas network service provider can propose their specific averaging period.

111. This chapter outlines the ERA's working view on averaging periods that should be applied in the 2022 gas instrument.

6.1 2018 position

112. The 2018 gas instrument set out that the averaging periods for the risk free rates used to estimate the return on debt and the return on equity:[42]

- Will have a duration of 20 consecutive trading days.
- Will be as close as possible to the expected access arrangement final decision for the regulatory period and prior to any of its dates taking place.
- Will be nominated by the respective gas network service providers. Where the averaging period is not nominated by a gas network service provider within 30 business days following an access arrangement draft decision, the ERA will use a default averaging period, being the 20 consecutive trading days one month prior to the access arrangement final decision for the regulatory period.

113. For the annual update of the debt risk premium, the 2018 gas instrument set out that the averaging period for the bonds in the benchmark sample:[43]

- will be 20 consecutive trading days as close as practical to the start of the relevant regulatory year.
- will be nominated by the respective gas network service provider. Where the averaging period is not nominated before the start of the regulatory period, the ERA will use a default averaging period of the 20 consecutive trading days ending two months prior to each regulatory year.

42 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 21.

43 ERA, *Final Rate of Return Guidelines (2018),* December 2018, pp. 24-25.

- must fall within a window at least two months prior to, but no longer than six months before the regulatory period.
- will be confidential.

114. The 2018 gas instrument specified that the ERA would estimate the expected inflation rate consistent with the estimate of the risk free rate by adopting an averaging period of 20 trading days.44

115. The averaging periods for the risk free rates on debt and equity and inflation remain confidential until the period has passed and are then disclosed in the final decision. The annual debt risk premium averaging periods generally remain confidential.[45]

6.2 Developments since 2018 instrument

116. The ERA has implemented averaging periods in line with the requirements of the 2018 gas instrument for three gas network service provider access arrangements since the 2018 gas instrument came into effect.[46]

117. The ERA has performed annual updates of the debt risk premium required for annual tariff variations for the three gas network service providers.

6.3 2022 position

118. For the 2022 gas instrument the ERA aims to clarify and standardise the averaging process.

119. The ERA considers that an averaging period of 20 trading days provides estimates of these parameters that reflect the prevailing rates while being robust to unnecessary volatility that may affect a shorter averaging period. Applying an averaging period of 20 trading days for these parameters will therefore provide reliable estimates of the efficient rates of return for gas network service providers.

120. The ERA considers that the 20 trading day windows provide confidence that the estimates of the risk free rates and inflation will provide the best estimate of the prevailing rates during the regulatory period, and similarly that the estimate of the debt risk premium will provide the best possible estimate of the cost of debt for each regulatory year.

121. While the ERA's working view is therefore to maintain averaging periods of 20 trading days, the ERA is considering allowing averaging periods of up to 40 trading days to help mitigate the effects of market volatility. The ERA welcomes alternative views on the length of the averaging periods and encourages stakeholders to submit their suggested approaches.

---

44 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 38.

45 In some instances, gas network service providers have disclosed their nominated averaging periods in their public tariff variation proposals.

46 These access arrangements are the access arrangement for the Dampier to Bunbury Natural Gas Pipeline for the 2021-2025 access arrangement period (published April 2021), the access arrangement for the Goldfields Gas Pipeline for the 2020-2024 access arrangement period (published December 2019) and the access arrangement for the Mid-West to South-West Gas Distribution Systems for the 2020-2024 access arrangement period (published November 2019).

122. The ERA proposes to continue to allow gas network service providers to nominate the averaging periods, subject to the above requirements. Allowing for flexible nominations provides the opportunity for the gas network service providers to best manage their financing arrangements and does not signal to the market unduly so as not to adversely affect the ability to obtain finance.

123. The ERA does not consider that allowing gas network service providers to select averaging periods will raise a material risk of biasing the estimates favourably for the gas network service providers and distorting the estimate of the efficient rate of return. Averaging periods are to be nominated before any of the dates in the period have occurred.

124. For clarity, the averaging approach proposed separately details:

- The market rates that are fixed at the start of the regulatory period. The rates include the risk free rate for the return on equity, the interest rate swap for the return on debt and the expected inflation.
- The debt risk premium that is updated annually through the tariff variation mechanism.

125. The ERA's working view is to adopt the following nomination and averaging periods for the 2022 gas instrument.

6.3.1 Market rates for WACC parameters

126. Details of the averaging period process for the market rates that will be fixed for the period of an access arrangement are provided as follows:

- A gas network service provider needs to advise the ERA of their nominated averaging period for market rates for WACC parameters.
- An averaging period must be nominated within 30 business days following the release of an access arrangement draft decision.
- The averaging periods must be nominated prior to any of their dates taking place.
- The averaging period will have a duration of 20 consecutive trading days.[47]
- The averaging period must fall within a window at least two months, but no longer than six months, prior to the start date for the regulatory period.
- If an averaging period is not nominated within 30 business days following an access arrangement draft decision, the ERA will use a default averaging period of the 20 consecutive trading days ending two months prior to the start of the regulatory period.
- The expected inflation forecast will use the same averaging period as is used for market rates of WACC parameters.
- The averaging periods for these market rates will remain confidential until the period has passed and will then be disclosed in the final decision.

[47] Trading days are defined as days that Australian Commonwealth Government Security mid-rate data is available in the RBA's F16 statistical table.

6.3.2 *Annual debt risk premium*

127. Details of the annual debt risk premium averaging period process are as follows:

- A gas network service provider needs to advise the ERA of their nominated debt risk premium averaging periods.
- An averaging period will be nominated for each debt risk premium for all years of an access arrangement's regulatory period.
- The first debt risk premium averaging period for an access arrangement must be nominated within 30 business days following an access arrangement draft decision.
- The remaining debt risk premium averaging periods must be nominated prior to the ERA's final decision for the regulatory period.
- The debt risk premium averaging periods must be nominated prior to any of their dates taking place.
- The averaging period will have a duration of 20 consecutive trading days.[48]
- The debt risk premium averaging period for each of the years does not need to be identical.
- The averaging period must fall within a window of at least three months, but no longer than seven months, before the relevant regulatory year.
- In the event that a debt risk premium averaging period is not nominated on time, the ERA will use a default debt risk premium averaging period of the 20 consecutive trading days three months prior to the commencement of each regulatory year.
- The annual debt risk premium averaging periods will remain confidential so as not to adversely affect a regulated entity's ability to obtain finance.

128. The ERA's proposal that the averaging period for the debt risk premium must fall within a window of at least three months, but no longer than seven months, before the relevant regulatory year is a change from the current gas instrument.

129. The current gas instrument sets out that the averaging period can fall anywhere in the period between two and six months before the relevant regulatory year. The ERA proposes this change to allow sufficient time for finalising the calculation of gas network service providers' debt risk premiums before the annual reference tariff variation process. The debt risk premium is an input into networks' annual reference tariff variations. Currently, gas network service providers must provide the ERA with their completed scheduled reference tariff variation notices at least 40 business days before the start of each regulatory year. The ERA considers that allowing for an additional month for finalising the debt risk premium estimations will mitigate the risk of delays in the annual reference tariff variation process.

Question 2

Do you agree with the standardised averaging period process? If not, please explain why and your alternative approach.

[48] Trading days are defined as days that Australian Commonwealth Government Security mid-rate data is available in the RBA's F16 statistical table.

7. Gearing

130. Gearing is the proportion of a business' assets financed by debt and equity. Gearing is defined as the ratio of the value of debt to total capital (that is, the sum of debt and equity) and is generally expressed as follows:

$$Gearing = \frac{Debt}{Debt+Equity} \quad \text{(equation 2)}$$

131. The NGL states that the approach for calculating a rate of return on capital must include a weighted average of an allowed return on equity and an allowed return on debt.

> 30D [ERA] to make rate of return instrument
>
> …
>
> (3) The [ERA] may make an instrument only if satisfied the instrument will, or is most likely to, contribute to the achievement of the national gas objective to the greatest degree.
>
> (4) Subject to subsection (3), the way to calculate a rate of return on capital must include a weighted average of an allowed return on equity and an allowed return on debt.

132. The ERA uses the gearing ratio to weight the costs of debt and equity when the regulated WACC is determined.

133. In addition to being used to weight the expected returns on debt and equity to determine the regulated rate of return, the gearing ratio is used:

- To re-lever asset betas for the purposes of estimating the equity beta of regulated firms.
- As a factor in determining an appropriate credit rating for deriving the debt risk premium.
- To determine interest and tax expenses in a post-tax revenue model.

134. This chapter outlines the ERA's working view on the approach to determining gearing that should apply in the 2022 gas instrument.

7.1 2018 position

135. The 2018 gas instrument applied a gearing level of 55 per cent, which was fixed over the period of the instrument.[49]

136. The average gearing of a benchmark sample informed the benchmark efficient level of gearing.[50]

137. The ERA observed the average gearing across various definitions of debt and equity and examined the drivers of the results. The ERA's analysis indicated a benchmark gearing level of 55 per cent debt.[51]

[49] ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 15.

[50] ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 15.

[51] ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 15.

7.2 Developments since 2018 instrument

138. The AER's 2020 annual rate of return update analysed the gearing level of energy networks. This analysis showed that gearing levels based on market values were 52 per cent over a five-year average and 55 per cent over a 10-year average.[52]

139. The AER has reviewed gearing as part of its 2022 rate of return instrument review. The AER observed an increased use of hybrid securities by regulated businesses in 2020 and 2021. Hybrid securities are securities that have characteristics of both debt and equity. These hybrid issuances included:[53]

- In September 2020, AusNet Services issued a $650 million, 60-year AUD denominated hybrid security in the form of non-convertible subordinated notes.
- In March 2021, AusNet Services issued a €700 million, 60-year EUR hybrid security in the form of non-convertible subordinated notes.
- In May 2021, Spark Infrastructure announced that TransGrid had secured a $295 million hybrid security instrument in the form of subordinated notes from the Clean Energy Finance Corporation. Spark Infrastructure has a 15 per cent ownership in TransGrid.

140. The AER noted that its 2020 annual update did not include AusNet Services' recent hybrid security issuances as they were issued after annual reports were released.[54]

141. The AER considered that the main difficulty with including hybrid securities was the apportionment between debt and equity.[55] The AER is further investigating the treatment of hybrid securities when estimating gearing and what method should be used for allocating between debt and equity. If a suitable method is not available, the AER indicated that it may exclude hybrid securities from the gearing calculation or apply a simple 50/50 allocation between debt and equity.[56]

7.3 2022 initial position

142. The ERA's working view is that a gearing level of 55 per cent should be maintained for the 2022 gas instrument.

143. The ERA considers that the gearing ratio should be determined from observations of the gearing levels of firms in a benchmark sample of listed Australian energy networks. The gearing levels of Australian energy networks will most closely reflect the regulatory and commercial risks involved in providing regulated services.

52 AER, *Rate of Return Annual Update*, December 2020, p. 6.
53 AER, *Overall Rate of Return: Draft Working Paper*, July 2021, p. 35.
54 AER, *Overall Rate of Return: Draft Working Paper*, July 2021, p. 35.
55 AER, *Overall Rate of Return: Draft Working Paper*, July 2021, p. 36.
56 AER, *Overall Rate of Return: Draft Working Paper*, July 2021, p. 37.

144. The ERA considers that the use of average gearing from the benchmark sample is appropriate. Using average gearing is a commonly applied approach that involves averaging performance measures across similar firms to infer an attainable benchmark. The actual capital structure decisions of a service provider may differ from the benchmark firm. However, under the principles of incentive regulation, the regulator does not compensate the regulated service provider for its actual decisions but instead compensates it as if it were operating efficiently.

145. Gearing requires estimates of the value of a firm's debt and equity, which can be obtained from a firm's financial statements or from market values of traded debt and equity securities.

146. In principle, the values of debt and equity should be obtained from the same information source, that is, obtained from either book or market data. However, liquidity limitations restrict the ability to source market data for debt securities and a proxy may have to be used. The ERA uses a market-based gearing level to reflect efficient financing.

147. Partington and Satchell considered that market values should be used when estimating gearing where possible.[57]

148. The ERA has updated its gearing estimate using current data and the same approach detailed in the 2018 gas rate of return instrument.[58] Table 3 details the gearing estimate for benchmark entities based on observable data from comparable firms.

Table 3: ERA market value gearing estimates (%)

	APA Group (APA)	AusNet Services (AST)	DUET Group (DUE)	Spark Infrastructure Group (SKI)	Average
2016	49	57	51	54	52
2017	49	52	N/A	52	51
2018	46	56	N/A	57	53
2019	45	55	N/A	60	53
2020	45	59	N/A	60	55
5-year average	**47**	**56**	**51**	**57**	**52**

Source: Annual reports, Bloomberg, ERA analysis.

149. The ERA's analysis estimates that average gearing for the energy network sample is 52 per cent.

150. Recognising that DUET is delisted and removing it from the analysis produces an average gearing for the energy network sample of 53 per cent. The ERA has also extended its analysis to include the last observable five years for DUET, where DUET's five-year average gearing is 64 per cent. The five-year average of the sample increases to 56 per cent when using DUET's last observable five years.

[57] Partington, G. and Satchell, S., *Report to the AER: WACC and leverage,* May 2021, p. 20.

[58] ERA, *Final Rate of Return Guidelines Explanatory Statement,* December 2018, p. 66.

151. The AER's recent analysis has shown that gearing levels based on market values are 52 per cent over a five-year average or 55 per cent over a 10-year average.[59]

152. On the basis of the above information, including considerations around DUET being delisted, maintaining a gearing level of 55 per cent may be warranted when rounding to the closest five percentage points.

153. The ERA's approach to estimating gearing adjusts debt and equity to recognise the nature of hybrid securities, based on publicly available information.[60] The ERA's approach removes hybrid securities that have equity characteristics from debt. The ERA uses publicly available information to inform these adjustments.

154. The ERA will give further consideration to the treatment of new hybrid securities issued by the network businesses, including the characteristics of the most recent hybrid securities, as part of the development of the draft 2022 gas instrument. Depending on their characteristics it may be appropriate to either:

- Remove from debt hybrid securities that have predominately equity characteristics.
- Take a simple approach of a 50/50 allocation between debt and equity.

Question 3

Do you support the use of a gearing level of 55 per cent for the 2022 gas instrument? If not, please explain why and your alternative approach.

Question 4

When determining gearing do you support the ERA adjusting debt and equity to recognise hybrid securities and what is a suitable method for allocating hybrid securities between debt and equity? If not, please explain why and your alternative approach.

59 AER, *Rate of Return Annual Update,* December 2020, p. 6.

60 ERA, *Final Rate of Return Guidelines Explanatory Statement,* December 2018, p. 66.

8. Return on debt

155. The WACC includes a component for the return on debt. The return on debt is the return that debt holders require from a firm to compensate them for the risk they take in providing debt financing to the company.

156. This chapter outlines the ERA's working view on the approach for estimating the return on debt and its parameters that should apply in the 2022 gas instrument.

8.1 Return on debt calculation

8.1.1 2018 position

157. The 2018 gas instrument implemented a hybrid trailing average approach for its debt approach. Under the hybrid trailing average approach:[61]

- The benchmark entity enters into the assumed benchmark efficient debt strategy. In this case, the strategy was assumed to be a portfolio of 10-year fixed-rate debt with 10 per cent refinanced each year.
- The benchmark entity uses derivative arrangements to adjust rates from the efficient debt portfolio to lock in five-year bank bill swaps rates, set on the day at the start of the regulatory period.
- A 10-year trailing average debt risk premium is used as the credit risk of debt issuances cannot be hedged.
- The 10-year trailing average debt risk premium is updated annually through the tariff variation mechanism, which accommodates annual changes in the credit risk of new debt issuances.

158. The ERA considered that a hybrid trailing average approach best approximated the NPV=0 principle while also recognising interest rate risk, refinancing risk and the staggered nature of debt portfolios.

159. The 2018 gas instrument estimated the return on debt based on a risk premium above the risk free rate, plus an additional margin for administrative and hedging costs:[62]

$$Return\ on\ debt = risk\ free\ rate + debt\ risk\ premium + debt\ raising\ costs + hedging\ costs \quad \text{(equation 3)}$$

160. The risk free rate is the rate of return of a hypothetical investment with no risk of financial loss, over a given period of time.

161. The debt risk premium is the margin above the risk free rate of return, required to compensate holders of debt securities for the risk of providing debt finance. The debt risk premium is compensation for investors who tolerate the extra risk, compared to that of a risk free asset.

61 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, p. 84.

62 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, p. 83.

162. The return on debt estimated for the first year of an access arrangement contributes to the setting of the initial revenue path for the remaining years of the regulatory period (that is, for years two to five).[63]

163. The ERA revises the return on debt each year to incorporate an annual update of the estimate of the debt risk premium. Each year, the ERA estimates the latest on-the-day value of the debt risk premium over the specified averaging period. The value is then incorporated into the 10-year trailing average, replacing the estimate made 10 years prior.[64]

164. Debt raising and hedging costs are the administrative costs and other charges incurred by businesses in raising and hedging finance.

8.1.2 Developments since 2018 instrument

165. Following its decision to change its term of expected inflation from 10 years to 5 years, the AER decided that it was appropriate to review the term of the rate of return to check whether its current approach remained appropriate.[65]

166. In its final working paper, the AER decided to leave the term of equity and term of debt open for further consideration as part of its concurrent evidence sessions in 2022:[66]

- The AER considered that the terms for the return on equity, return on debt and expected inflation should be independently assessed. The AER noted that common principles underpin the choice of term in each case, in particular the NPV=0 principle.[67]
- The AER examined the form of return on debt and chose to maintain its trailing average approach.[68]

167. In the AER's review of the appropriate term for the rate of return, it engaged Dr Martin Lally.[69] Dr Lally's advice included the following:

- With respect to the cost of debt the appropriate debt term is dependent on the form of the return on debt. The different forms for established firms include the trailing average and hybrid approaches, and for a new firm it could be something different that is more reflective of on-the-day rates. The NPV=0 principle requires that the allowed cost of debt match that incurred by the benchmark efficient firm.[70]
- Both the trailing average approach and hybrid trailing average approach satisfied the NPV=0 principle, as both approaches allowed firms to align their borrowing arrangements with the regulatory allowance.[71]

63 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 17.

64 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 17.

65 AER, *Final position: Regulatory treatment of inflation,* December 2020, p. 23.

66 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, p. 17.

67 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, pp. 43-44.

68 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, p. 60.

69 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021.

70 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 53.

71 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 53.

- With respect to the hybrid trailing average approach, the appropriate term for the allowed debt risk premium would be historical and equal to the term for which the benchmark efficient entity borrows, whilst the appropriate term for the allowed risk free rate within the cost of debt would be the future term of the regulatory period.[72]

168. The AER undertook analysis on energy network debt data and found that the weighted average term to maturity at issuance ranges from eight to 11 years, depending on various scenario analyses by adjusting the percentages of drawdown of bank debt. While the AER is undertaking further assessment, the analysis confirmed that 10 years is in the range of terms of debt issuance.[73]

169. The Queensland Competition Authority undertook a review of its rate of return method and considered its approach to estimate the return on debt.[74] The Queensland Competition Authority decided to adopt a benchmark 10 year trailing average approach for its cost of debt estimation.[75] The Queensland Competition Authority did not have a transition period to implement the benchmark trailing average.[76]

8.1.3 2022 initial position

170. With the release of further reports on the cost of debt with regulated entities, the ERA has given further consideration to its return on debt approach.

171. The ERA's working view is to maintain the use of a hybrid trailing average approach for its debt approach for the 2022 gas instrument.

172. Consistent with national gas objective and the revenue and pricing principles, the ERA considers that the service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs. The NPV=0 principle also helps ensure that investors are compensated at a level to encourage efficient investment, so that the present value of the future stream of expected cash flows of a firm is equal to the regulated asset base.

173. The ERA considers that an efficient debt approach should satisfy the NPV=0 principle and recognise various financing risks, including:

- Refinancing risk: the possibility that the firm will not be able to roll over its debt when its existing facilities end.
- Interest rate mismatch risk: the possibility that when the firm refinances, it will face interest rates that diverge from those underpinning its pricing and revenue.

174. In recent decisions for regulated energy networks in Western Australia, the ERA has used the hybrid trailing average approach to determine the return on debt.[77,78]

---

72 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 40.

73 AER, *Rate of return – Energy network debt data – Final working paper*, November 2020, pp. 16-18.

74 QCA, *Final Report: Rate of Return Review*, November 2021.

75 QCA, *Final Report: Rate of Return Review*, November 2021, p. 28.

76 QCA, *Final Report: Rate of Return Review*, November 2021, p. 28.

77 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, September 2018, p. 66.

78 ERA, *Final Rate of Return Guidelines*, December 2018, p. 16.

175. Under the hybrid trailing average approach for debt:

- The benchmark entity enters into the assumed benchmark efficient debt strategy, assumed to be a portfolio of 10-year fixed-rate debt with 10 per cent refinanced each year.
- The benchmark entity uses derivative arrangements to adjust rates from the efficient debt portfolio to lock in five-year bank bill swaps rates, set on the day at the start of the regulatory period.
- The 10-year trailing average debt risk premium is updated annually.

176. The ERA continues to support a benchmark efficient debt strategy that delivers a portfolio of 10-year fixed-rate debt with 10 per cent refinanced each year. The ERA considers that this is an efficient and implementable debt strategy for a long-term asset.

177. The ERA maintains that the use of derivative arrangements to adjust rates to lock in a five-year bill swap at the start of the regulatory period appropriately aligns cost of debt in the regulatory context.

178. Dr Lally's recent advice has reconfirmed that the hybrid trailing average approach satisfies the NPV=0 principle and allows firms to align their borrowing arrangements with the regulatory allowance.[79]

179. The ERA considers that a hybrid trailing average approach best approximates the NPV=0 principle while also recognising interest rate risk, refinancing risk and the staggered nature of debt portfolios. Further, when compared to a trailing average method, the hybrid trailing average approach currently yields lower estimates of the cost of debt and produces estimates that are more volatile.

180. Departing from the current hybrid trailing average approach may be difficult as the benchmark service provider has:

- Established a portfolio of 10-year fixed-rate debt.
- Entered into derivative arrangements to convert part of these annual debt issuances to floating bank bill swap rates.

181. Maintaining the current hybrid trailing average approach would promote regulatory certainty.

182. The ERA considers that an annual allowance of debt-raising costs and debt-hedging costs should be included for the return on debt estimation, recognising the administrative costs and other charges incurred by businesses when obtaining and hedging debt financing.

183. The ERA's working view is to continue to estimate the return on debt based on a risk premium above the risk free rate, plus an additional margin for administrative and hedging costs.

184. The individual debt components are further discussed below.

[79] Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 53.

185. The ERA's working view is that the above approach to estimating the return on debt will provide the best estimate of the return on debt for gas network service providers for the regulatory period and best achieves the national gas objective and the revenue and pricing principles in the long-term interests of consumers.

Question 5

Do you support the use of a hybrid trailing average approach for the cost of debt estimation? If not, please explain why and provide details of your alternative approach, including transitionary arrangements.

8.2 Risk free rate

186. The risk free rate is the return an investor would expect when investing in an asset with no risk.

187. 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.

188. This section outlines the ERA's working view on the approach to estimating the risk free rate for the return on debt that should apply for the 2022 gas instrument.

8.2.1 2018 position

189. Under the 2018 gas instrument the ERA used the prevailing five-year interest rate swap for the return on debt.[80]

190. The swap rate is referred to as the base rate in the return on debt calculation. It incorporates a spread to the rate of Commonwealth Government Security bonds and is available at specified terms from data providers such as Bloomberg.

191. The 2018 gas instrument specified that for the risk free rate for the return on debt:

- The ERA used a five-year term to estimate the swap rate, consistent with the hybrid trailing average debt approach.[81]
- The ERA set the swap rate at the start of a regulatory access arrangement period and the estimate is fixed for the length of the regulatory access arrangement period.[82]

8.2.2 Developments since 2018 instrument

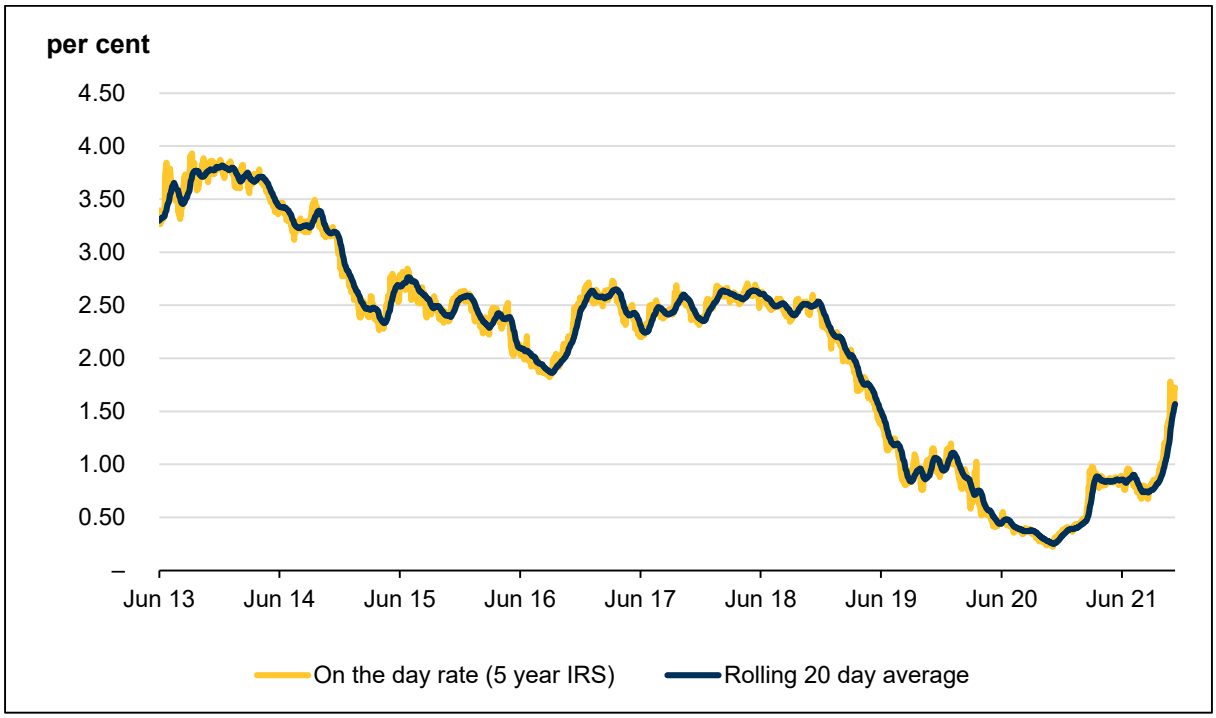
192. The five-year interest rate swap yields have been below historic averages, as detailed in Figure 1.

80 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 20.

81 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, p. 104.

82 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement,* December 2018, p. 100.

Figure 1 Five-year interest rate swap yields



Source: ERA analysis, based on Bloomberg data.

193. The near-term rates have been volatile and uncertain as the economy recovers from the COVID-19 pandemic, and there is increasing uncertainty around central bank monetary policy. In addition, inflation expectations in the market have recently increased, but there is also uncertainty as to whether this will be transitory or more permanent. This raises the possibility of volatile rates during the period in which the 2022 gas instrument is in effect.

8.2.3 2022 initial position

194. The ERA's working view for the 2022 gas instrument is to maintain its use of the five-year interest rate swap rate as the proxy to estimate the risk free rate for the return on debt.

195. The ERA will use this yield to set the risk free rate for the return on debt at the start of the regulatory access arrangement period. This rate will be fixed for the duration of the regulatory period.

196. The ERA has used a five-year bank bill swap rate for its energy network regulatory determinations.[83,84]

197. The five-year interest swap spread captures the credit risk of financial institutions. The interest rate swap rate is the index rate at which financial institutions borrow from and lend to each other. Interest rate swaps provide a strong means to hedge and manage risk.

83 ERA, *Final Rate of Return Guidelines*, December 2018, p. 20.

84 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, September 2018, p. 66.

198. The ERA considers that the use of the swap rate:

- Provides a strong means to hedge and manage risk.
- Simplifies the calculation of the debt risk premium.
- Produces a closer match between the allowed cost of debt and the cost actually incurred by the firm.

199. If debt risk premiums are estimated consistently with the chosen base rate – whether that base be the Commonwealth Government Security risk free rate or the swap rate – there should be no difference in the resulting build-up of the overall return on debt. The two approaches just represent two different ways of splitting the total interest rate.

200. The ERA considers that this approach for the risk free rate for the return on debt best delivers an efficient rate of return for the benefit of the long-term interests of consumers.

8.3 Benchmark credit rating

201. The benchmark credit rating is an input required to estimate the debt risk premium.

202. 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.

203. Credit ratings provide a broadly uniform measure of default risk. Firms with the same credit rating at a particular point in time should have similar levels of default risk.

204. Generally, the debt risk premium is higher when the credit rating is lower, and vice versa. A lower credit rating can be associated with a higher risk of default and lenders generally require higher compensation (a higher debt risk premium) for higher levels of risk.

205. This characterisation of risk eliminates the need to rely on listed firms, as is the case for equity beta, because it is not measured relative to an index based on a domestic stock exchange. For this reason, both listed and unlisted firms can be used where a credit rating is available.

206. This section outlines the ERA's working view on the credit rating that will be used as an input into estimating the debt risk premium that the ERA considers should be applied for the 2022 gas instrument.

8.3.1 2018 position

207. The 2018 gas instrument used a benchmark credit rating of BBB+, which was fixed over the period of the instrument.[85]

[85] ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 22.

208. The ERA took the median credit rating of a sample of comparator businesses to determine the credit ratings of the benchmark efficient entity. Other regulators' decisions were used as a cross-check.[86]

209. The ERA determined a credit rating of BBB+ to be appropriate for application in the cost of debt estimations.

210. For the 2018 gas instrument, the benchmark credit rating determines the sample of 10-year bonds used to calculate the cost of debt and should reflect the credit rating of a benchmark efficient entity.

8.3.2 Developments since 2018 instrument

211. The AER's 2020 annual rate of return update analysed the credit ratings of energy networks. The AER's update showed that the median credit rating in 2020 was unchanged at BBB+.[87]

8.3.3 2022 initial position

212. The ERA's working view for the 2022 gas instrument is that a benchmark credit rating of BBB+ should be maintained.

213. The ERA has applied a benchmark credit rating of BBB+ for recent energy network determinations.[88,89]

214. The ERA's review of the credit ratings of the Australian energy network sample found that credit ratings varied between BBB and A-. The median credit rating was BBB+ (see Table 4).

Table 4: Firms in the Australian energy network sample

Firm	Credit rating
APA	BBB
Ausnet	A-
Spark Infrastructure	BBB+

Source: ERA analysis

215. Other regulators' decisions also support a credit rating of BBB+.

216. On the basis of this analysis and cross-checks, the ERA determines a benchmark credit rating of BBB+ to be appropriate for the 2022 gas instrument.

217. For the 2022 gas instrument, the benchmark credit rating determines the sample of 10-year bonds used to calculate the cost of debt and should reflect the credit rating of a benchmark efficient entity.

86 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 22.

87 AER, *Rate of Return Annual Update,* December 2020, p. 19.

88 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 22.

89 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, September 2018, pp. 73-74.

218. The ERA considers that a benchmark credit rating of BBB+ for the return on debt best delivers an efficient rate of return for the benefit of the long-term interests of consumers.

Question 6

Do you support the use of a benchmark credit rating of BBB+ for the 2022 gas instrument? If not, please explain why and your alternative approach.

8.4 Debt risk premium

219. The debt risk premium is the return above the risk free rate that lenders require to compensate them for the risk of providing debt funding to a benchmark business. The debt risk premium compensates holders of debt securities for the possibility of default by the issuer.

220. This section outlines the ERA's working view on the approach for estimating the debt risk premium that should apply for the 2022 gas instrument.

8.4.1 2018 position

221. The 2018 gas instrument applied the revised bond yield approach to determine the debt risk premium.[90]

222. Consistent with the hybrid trailing average debt approach and a benchmark efficient debt strategy, the ERA used a 10-year term to estimate the debt risk premium.[91]

223. The revised bond yield approach specified by the 2018 gas instrument involved the following steps:[92]

- Step 1: Determining the benchmark sample - Identifying a sample of relevant domestic and international corporate bonds that reflect the credit rating of the benchmark efficient entity.
- Step 2: Collecting data and converting yields to Australian dollar equivalents - Converting the bond yields from the sample into hedged Australian dollar equivalent yields inclusive of Australian swap rates.
- Step 3: Averaging yields over the averaging period – Calculating an average AUD equivalent bond yield for each bond across the averaging period.
- Step 4: Estimating curves - Estimating yield curves on this data by applying the Gaussian Kernel, Nelson-Siegel and Nelson-Siegel-Svensson techniques.
- Step 5: Estimating cost of debt - Calculating the simple average of the three yield curves' 10-year costs of debt to arrive at a market estimate of the 10-year cost of debt.
- Step 6: Calculating the debt risk premium - Calculating the debt risk premium by subtracting the 10-year interest rate swap rate from the 10-year cost of debt.

90 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 23.

91 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 23.

92 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 23.

224. These steps determine the debt risk premium at a point in time, being the date of calculation.

225. To determine the debt risk premium used to calculate the gas rate of return, the 2018 gas instrument specified that the ERA would construct a 10-year trailing average debt risk premium. This consisted of a debt risk premium for the current year and a debt risk premium for each of the nine prior years. The 10-year trailing average debt risk premium will be updated each year.[93]

226. The 2018 gas instrument provided that an allowance for debt risk premium estimation costs will be reviewed in the ERA's assessment of efficient operating expenditure for a regulated business' access arrangement and does not form part of the rate of return.[94]

8.4.2 Developments since 2018 instrument

227. As discussed in section 8.1.2, the AER engaged Dr Lally to review the appropriate term for the rate of return. For the return on debt, Dr Lally considered that, with respect to the hybrid trailing average approach, the appropriate term for the allowed debt risk premium would be the future term for which the benchmark efficient entity borrows.[95]

228. The debt risk premium relies on two inputs: the term of debt and the benchmark credit rating.

229. As part of the 2022 rate of return review process, the AER considered that:

- the term of debt (10 years) should match that of an efficient firm's borrowing[96]
- the median benchmark credit rating remained at BBB+.[97]

8.4.3 2022 initial position

230. The ERA's working view for the 2022 gas instrument is to maintain its use of the revised bond yield approach to estimate the debt risk premium.

231. Consistent with the hybrid trailing average approach to debt:

- the debt risk premium is estimated based on a 10-year trailing average
- the 10-year trailing average debt risk premium is updated annually.

232. The ERA has used the revised bond yield approach across its regulatory determinations.[98, 99, 100, 101]

---

93 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 23.

94 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 23.

95 Dr Lally,M., *The Appropriate Term for the Allowed Cost of Capital*, April 2021, p. 40.

96 AER, *Term of the rate of return & Rate of return and cashflows in a low interest rate environment: Final working paper*, September 2021, p. 43.

97 AER, *Rate of Return: Draft Debt Omnibus Paper*, July 2021, p. 31.

98 ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 23.

99 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, September 2018, p. 75.

100 ERA, *Final Determination 2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks and Pilbara Railways*, August 2019, p. 25.

101 Technical detail and tools to run the ERA's revised bond yield approach can be found on the ERA's website.

233. The ERA considers that the revised bond yield approach:

- Is transparent, because the sample of bonds underlying the bond yield approach estimates is published.
- Is drawn from market data.
- Provides flexibility in sampling bonds within particular credit ratings.
- Reflects market conditions for a nominated averaging period.
- Recognises the reality that Australian firms also source debt funding overseas.
- Directly targets a debt tenor of 10 years.
- Is more robust to volatile market yields by virtue of using yield observations averaged over the averaging period instead of using methods based on one day of observations.

234. The ERA considers that this debt risk premium estimation approach best delivers an efficient rate of return for the benefit of the long-term interests of consumers.

Question 7

Do you support the use of the revised bond yield approach for estimating the debt risk premium? If not, please explain why and your alternative approach.

9. Debt and equity raising costs

235. Debt and equity raising costs and debt hedging costs are the administrative costs and other charges incurred by businesses when obtaining and hedging finance.

236. Regulators across Australia have typically included allowances to account for the costs of raising finance in their regulatory decisions. Regulators take different approaches to the recovery of these financing costs through either:

- the rate of return
- operating expenditure

or

- the capitalisation of these costs.

237. Australian regulators use benchmark estimates to determine debt-raising costs. To do so, regulators attempt to derive an estimate of the cost of obtaining finance that reflects the costs that would be incurred by a well-managed efficient benchmark business operating in a competitive market.

238. This section outlines the ERA's working view on the debt and equity raising costs that should apply for the 2022 gas instrument.

9.1 2018 position

239. The 2018 gas instrument set out that the rate of return would include:[102]

- a debt-raising cost allowance of 0.100 per cent per annum
- a debt-hedging cost allowance of 0.114 per cent per annum.

240. The ERA considered that the debt-raising costs included in the rate of return should only include the direct cost components recommended by the Allen Consulting Group in its 2004 report to the Australian Competition and Consumer Commission.[103] The approach set out in this report had been adopted by Australian regulators over the last 10 years. The ERA considered that this approach was robust, still relevant and fit-for-purpose.

241. An allowance for debt hedging costs was provided to firms to compensate them for the costs of conducting hedging for exposure to movements in the risk free rate for the hybrid trailing average debt approach.[104]

242. The ERA provided an allowance for equity raising transaction costs in the capex building block, and so equity raising costs did not form part of the rate of return.[105]

[102] ERA, *Final Rate of Return Guidelines (2018)*, December 2018, pp. 35-36.

[103] The Allen Consulting Group, *Debt and Equity Raising Transaction Costs: Final Report*, December 2004.

[104] The Allen Consulting Group, *Debt and Equity Raising Transaction Costs: Final Report*, December 2004.

[105] The Allen Consulting Group, *Debt and Equity Raising Transaction Costs: Final Report*, December 2004.

9.2 Developments since 2018 instrument

243. The AER has been reviewing the debt approaches of energy networks and is seeking information from service providers. As part of this, the AER is to review debt raising costs collected from its debt regulatory information notice to be issued in 2021.[106, 107]

244. In the 2021 rate of return review final paper, the Queensland Competition Authority considered that it was appropriate to allow debt raising costs of 10 basis points within the cost of debt.[108]

9.3 2022 initial position

245. The ERA's working view for the 2022 gas instrument is to maintain an allowance to account for:

- 0.100 per cent for debt raising costs
- 0.114 per cent for debt hedging costs.

246. The ERA has used a debt-raising cost allowance of 0.10 per cent per annum in past determinations.[109, 110, 111]

247. The ERA has used a debt-hedging cost allowance of 0.114 per cent per annum in past determinations.[112, 113]

248. The ERA considers that direct debt-raising costs will be recompensed in proportion to the average annual issuance, and will cover:

- gross underwriting fees
- legal and roadshow fees
- company credit rating fees
- issue credit rating fees
- registry fees
- paying fees.

249. Indirect costs should not be included in the estimate of debt-raising costs and will not be compensated.

106 AER, *Overall rate of return: Draft working paper,* July 2021, p. 15.

107 AER, *Rate of Return Draft Debt Omnibus Paper,* July 2021, p. 36.

108 QCA, *Final Report: Rate of Return Review*, November 2021, p. 50.

109 ERA, *Final Determination 2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks and Pilbara Railways*, August 2019, pp. 32-34.

110 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 35.

111 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base,* September 2018, pp. 81-84.

112 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 35.

113 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base,* September 2018, pp. 81-84.

250. Debt hedging costs are the administrative costs and other charges incurred by businesses when hedging finance. Given a regulated business's portfolio of long-term debt and its resetting regulatory cashflows, it is reasonable to assume that such a business would enter into arrangements to manage risk.

251. The ERA engaged Chairmont Consulting to review debt issuing and hedging costs for a regulated benchmark energy network that is operating efficiently consistent with the ERA's debt approach. The ERA will further consult on the findings of Chairmont's review when it is complete.

252. The ERA considers that this debt raising and debt-hedging cost estimates approach best delivers an efficient rate of return for the benefit of the long-term interests of consumers.

10. Return on equity

253. The return on equity is the return that investors require from a firm to compensate them for the risk they take by investing their capital.

254. There are no readily observable proxies for the expected return on equity. While estimates of the cost of debt can be obtained by observing debt instruments, financial markets do not provide a directly observable proxy for the cost of equity, for either individual firms or for the market.

255. Estimating a forward-looking return on equity – sufficient to enable regulated firms to recoup their prevailing equity financing costs – requires the use of models.

256. The model most used by Australian regulators for quantifying the return on equity has been the Sharpe-Lintner Capital Asset Pricing Model (CAPM).

257. This chapter outlines the ERA's working view on the approach for estimating the return on equity and its parameters that should apply for the 2022 gas instrument.

10.1 Return on equity model

10.1.1 2018 position

258. The 2018 gas instrument adopted the Sharpe-Lintner CAPM to estimate the return on equity.[114]

259. Under the 2018 gas instrument, the ERA determines a single point estimate for the return on equity using the Sharpe-Lintner CAPM, applying the following formula:

$$R_i = R_f + \beta_i(R_m - R_f) \qquad \text{(equation 4)}$$

where:

R_i is the required rate of return on equity for the asset, firm or industry in question

R_f is the risk free rate

β_i is the equity beta that describes how a particular portfolio *i* will follow the market which is defined as $\beta_i = cov(R_i, R_m)/var\ (R_m)$

$(R_m - R_f)$ is the market risk premium.

260. To estimate the return on equity the ERA would separately estimate:

- the risk free rate
- the equity beta
- the market risk premium.

[114] ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 27.

261. The ERA's 2018 gas instrument adopted a return on equity calculated on a five-year term, which best approximated the NPV=0 principle consistent with the national gas objective and revenue and pricing principles in the long-term interest of consumers.[115]

10.1.2 Developments since 2018 instrument

262. The Sharpe-Lintner CAPM remains the foundational model considered by economic regulators in Australia.

263. Recent reviews of the return on equity by the Queensland Competition Authority and the AER has endorsed that the Sharpe-Lintner CAPM is the foundational model.[116, 117]

264. In 2020, the AER commenced a review of the term of the rate of return and in September 2021 published a final working paper.[118] In the paper, the AER decided to leave the term of equity open for further consideration as part of its concurrent evidence sessions in 2022.[119] In the paper, the AER:

- Considered that the terms for the return on equity, return on debt and expected inflation should be independently assessed. The AER noted that common principles underpin the choice of term in each case, in particular the NPV=0 principle.[120]
- Explored options for the term for equity, including matching to the regulatory period (typically five years) or matching to the underlying asset lives (typically 10 years to reflect the long asset lives).[121] Consistent with the AER's inflation review, the same NPV=0 principle when applied to the term of the return on equity would support matching to the length of the regulatory period.[122]

265. Dr Lally's advice to the AER regarding the term for equity included the following:

- The valuation problem facing a regulator with a five-year regulatory cycle is different from that of valuing an unregulated business.[123]
- The term for the return of equity, return on debt and expected inflation can be determined separately by applying the NPV=0 principle. The valuation problem for a regulator is like that for a business terminating in five years' time, or a floating rate bond whose coupon rate is reset every five years.[124]
- In respect of the cost of equity, the NPV=0 principle implies that the term must match the regulatory cycle.[125]

---

115 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, pp. 34-35.

116 QCA, *Final Report: Rate of return review*, November 2021, pp. 53-54.

117 AER, *CAPM and alternative return on equity models, Final working paper*, December 2020, p. 24.

118 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021.

119 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, p. 17.

120 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, pp. 43-44.

121 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, pp. 58-60.

122 AER, *Rate of return – Term of rate of return & Rate of return and cashflows in low interest rate environment – Final working paper,* September 2021, p. 18.

123 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 21.

124 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, pp. 3-4.

125 Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 52.

10.1.3 2022 initial position

266. The ERA's working view is to maintain the use of the Sharpe-Lintner CAPM for estimating the return on equity.

267. The ERA considers that the Sharpe-Lintner CAPM:

- is reflective of economic and finance principles and market information
- is commonly used by regulators and market participants
- is fit-for-purpose as it was developed for estimating the return on equity.

268. To estimate the return on equity the ERA will separately estimate:

- the risk free rate
- the equity beta
- the market risk premium.

269. The ERA's working view is to maintain the use of a term of equity of five years, equal to the regulatory period.

270. The valuation problem confronting a regulator with a five-year regulatory cycle is different from that of valuing an unregulated business. The ERA is concerned with estimating efficient costs attributable to a single regulatory period, rather than over the entire asset life. This is because the ERA resets the revenue allowance every regulatory period.

271. The ERA maintains its support for term matching, as far as possible, as this best approximates the NPV=0 principle and delivers efficient financing costs consistent with the national gas objective and revenue and pricing principles in the long-term interest of consumers .

272. Dr Lally's recent advice has reconfirmed that the best estimate of the return on equity should match the regulatory period.[126]

273. The ERA considers that the above approach to estimating the return on equity will best estimate the return on equity for the regulatory period and is in the long-term interests of consumers, because it will likely promote efficient investment in, and use of, gas networks services.

10.2 Risk free rate

274. The risk free rate is the return an investor would expect when investing in an asset with no risk.

275. 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.

[126] Dr Lally, M., *The appropriate term for the allowed cost of capital*, April 2021, p. 52.

276. 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 expected inflation rate was zero during an investment period. The ERA uses a nominal vanilla rate of return under the national gas framework and therefore a nominal risk free rate.

277. This section outlines the ERA's working view on the approach to estimating the risk free rate for the return on equity that should apply for the 2022 gas instrument.

10.2.1 2018 position

278. Under the 2018 gas instrument, the ERA used five-year Commonwealth Government Security bonds to estimate the risk free rate.[127]

279. The 2018 gas instrument specified that for the risk free rate for the return on equity:

- Consistent with the term of the return on equity, the ERA would use five-year terms to estimate the risk free rate.[128]
- The ERA would set the risk free rate at the start of a regulatory access arrangement period and the estimate would be fixed for the length of the regulatory access arrangement period.[129]
- Commonwealth Government Security bonds would be used as the proxy for risk free assets. The ERA would use the observed yields from these Commonwealth Government Securities to estimate the risk free rate. Due to it being uncommon to observe a Commonwealth Government Security bond with a remaining term to maturity exactly matching the term of the regulatory period, the ERA would use a linear interpolation of the observed yields of Commonwealth Government Security bonds to estimate the risk free rate.[130] [131]

10.2.2 Developments since 2018 instrument

280. The Commonwealth Government Security yields have been below historic averages, as detailed in Figure 2.

[127] ERA, *Final Rate of Return Guidelines (2018)*, December 2018, p. 20.

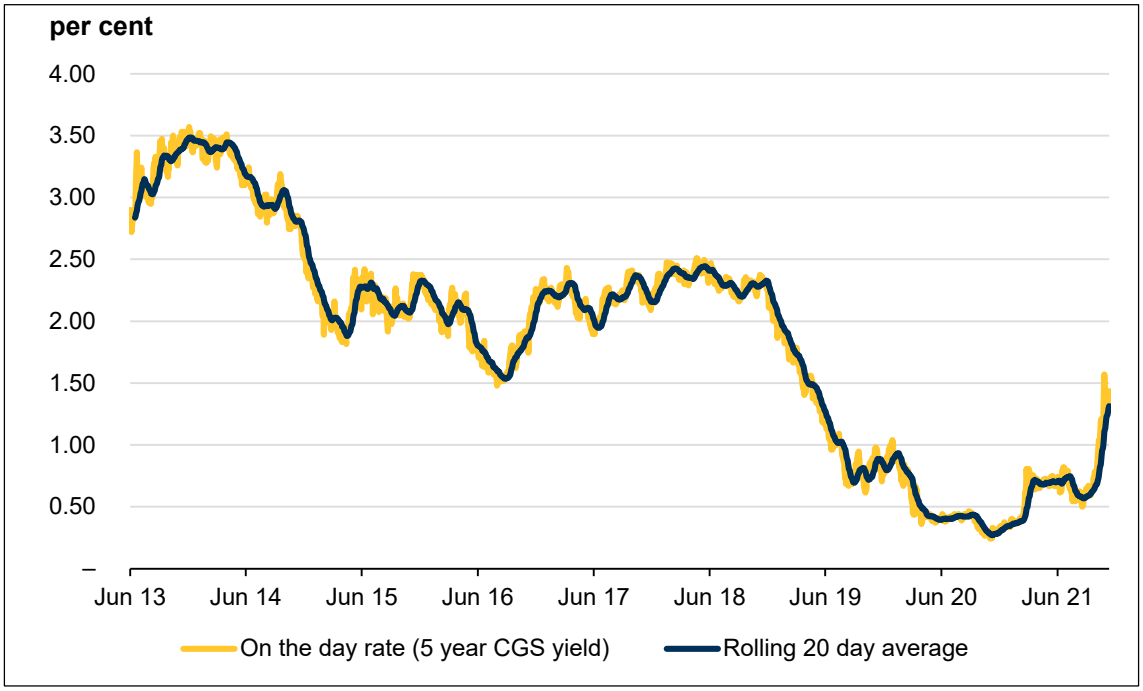
[128] ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, p. 104.

[129] ERA, *Final Gas Rate of Return Guidelines Explanatory Statement,* December 2018, p. 100.

[130] ERA, *Final Gas Rate of Return Guidelines Explanatory Statement,* December 2018, p. 101.

[131] In the linear interpolation approach, two bonds are selected with terms to maturity that fall on either side of the date on which the term of the regulatory period ends. 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.

Figure 2 Five year Commonwealth Government Securities yields



Source: ERA analysis, based on Reserve Bank of Australia F6 statistical tables.

281. The near-term risk free rate has been volatile and uncertain as the economy recovers from the COVID-19 pandemic, and there is increasing uncertainty around central bank monetary policy. In addition, inflation expectations in the market have recently increased, but there is also uncertainty as to whether this will be transitory or more permanent. This raises the possibility of a volatile risk free rate during the period in which the 2022 gas instrument is in effect.

282. The Australian sovereign debt market has seen intervention by the RBA in its conduct of monetary policy. Among the monetary policy measures, "yield curve control" has been used to influence Commonwealth Government Securities yields of certain maturities, with a focus on three-year government bonds. As of 2 November 2021, the RBA discontinued its bond yield targeting.[132]

283. The AER has been reviewing its 2018 rate of return instrument and has confirmed its preferred position of using yields from Commonwealth Government Securities as an appropriate proxy for the risk free rate.[133]

10.2.3 2022 initial position

284. The ERA's working view for the 2022 gas instrument is to maintain its use of a five-year Commonwealth Government bond for the risk free rate for the return on equity.

285. The ERA will use this yield to set the risk free rate at the start of the regulatory access arrangement period. This rate will be fixed for the duration of the regulatory period.

---

132 RBA, *Statement by Philip Lowe, Governor: Monetary Policy Decision*, 2 November 2021, available online.

133 AER, *Term of the rate of return & Rate of return and cashflows in a low interest rate environment: Final working paper*, September 2021, p. 102.

286. The ERA will continue to estimate the risk free rate by:

- Using observed yields from five-year Commonwealth Government bonds.
- Using linear interpolation of observed yields of Commonwealth Government Security bonds.

287. Commonwealth Government bonds are commonly used by other Australian regulators and market practitioners to determine the risk free rate.

288. The ERA acknowledges that Commonwealth Government Security yields are influenced by the RBA. However, the ERA considers that RBA intervention is an expected and normal part of Australian economic activity that is achieved by many channels. The ERA does not consider that the RBA's interventions in the longer-term Commonwealth Government Securities market affects the appropriateness of using the Commonwealth Government Securities as the proxy for the risk free rate.

289. The ERA considers that observed yields from Commonwealth Government Security bonds are the best proxy for risk free assets in Australia as they are:

- essentially free from default risk
- relatively liquid
- transparently and regularly reported.

290. The ERA considers that this approach for the risk free rate best delivers an efficient rate of return for the benefit of the long-term interests of consumers.

Question 8

When estimating the return on equity do you support the use of Commonwealth Government bonds as the risk free asset? If not, please explain why and your alternative approach.

10.3 Market risk premium

291. The market risk premium is a parameter of the Sharpe-Lintner CAPM.

292. The market risk premium is the expected rate of return in excess of the risk free rate that investors require to invest in a fully-diversified portfolio. *Ex ante*, investors always require a rate of return above the risk free rate to invest in a risky asset, therefore the expected market risk premium is always positive. *Ex post*, the realised return to the market portfolio may be negative. To establish the cost of capital, the *ex ante* market premium is relevant.

293. The market risk premium compensates an investor for the systematic risk of investing in a fully diversified portfolio. Systematic risk is risk that cannot be diversified away by investors because it affects all firms in the market.[134] This is a forward-looking concept.

[134] The foundation of the Sharpe-Lintner CAPM is the proposition that adding an asset to a portfolio reduces risk via the diversification effect but not beyond the risks that the assets in a portfolio share in common, that is, their systematic risk. At the limit, when one has invested in all available assets in the market portfolio, there is only systematic risk left. An important assumption of the CAPM is that assets are priced as though it is only their systematic risk that is relevant to investors.

294. The market risk premium is calculated as follows:

$$MRP = R_M - R_F \quad \text{(equation 5)}$$

where:

R_M is the expected market return on equity observed in the Australian stock market

R_F is the risk free rate of return.

295. This section outlines the ERA's working view on the approach to estimating the market risk premium that should apply for the 2022 gas instrument.

10.3.1 2018 position

296. The 2018 gas instrument applied a market risk premium of 6.0 per cent, which was fixed over the period of the instrument.[135]

297. The 2018 gas instrument set out the ERA's approach to estimating the market risk premium. The ERA determined an estimate of the market risk premium using the historic market risk premium, the dividend growth model and conditioning variables.[136]

298. The historic market risk premium is the average realised annual return that stocks have earned in excess of the government bond rate. The ERA considered that investors were likely to consider historical information on equity risk premiums to form their expected market risk premium.

299. The approach to estimating the historic market risk premium in the 2018 gas instrument followed the approach established by Ibbotson. The approach set out in the 2018 gas instrument is as follows:[137]

- Arithmetic and geometric averages of the historic market premium observations are calculated using the Brailsford, Handley and Maheswaran (BHM) and NERA Economic Consultancy datasets.
- Six overlapping time periods (1883-2017, 1937-2017, 1958-2017, 1980-2017 and 1988-2017) are used for averaging periods, to reflect different economic conditions.
- A simple average of the lowest arithmetic and highest geometric means of the produced historic market risk premium matrix is then used to estimate the historic market risk premium.

300. The dividend growth method examines the forecast future dividends for a market portfolio and estimates the return on equity that makes these dividends consistent with the market valuation of that portfolio. The ERA applied the two-stage dividend growth model to estimate the market risk premium.[138]

135 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 32.

136 ERA, *Final Rate of Return Guidelines (2018),* December 2018, pp. 30-32.

137 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 30.

138 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 30.

301. The ERA used conditioning variables to determine a final point estimate. Conditioning variables are readily available market data that allow the ERA to take into account current market conditions. The ERA used conditioning variables including:[139]

- default spreads
- the five-year interest rate swap spread
- dividend yields
- stock market volatility index.

302. When assessing current market conditions, the ERA considered how the current value of each conditioning variable compared to its historic average.

303. Under this approach the ERA:

- Placed more reliance on the historic market risk premium, relative to the dividend growth model.
- Placed less reliance on the dividend growth model, relative to the historic market premium.
- Determined a final point estimate of the market risk premium by using regulatory judgement, including considering conditioning variables. The final point estimate of the market risk premium would be rounded to one decimal place.

10.3.2 Developments since 2018 instrument

10.3.2.1 Market developments

304. The risk free rate has been reducing since 2018.

305. With the use of a fixed market risk premium over the term of the 2018 gas instrument, the return on equity has tracked lower as interest rates have declined.

306. The AER's 2020 annual rate of return update has provided market risk premium estimates across multiple methods and up to August 2020 where possible: [140]

- Historic market risk premium: the AER's update produced a range from 4.2 per cent to 6.5 per cent.
- Dividend growth model: the AER calculated a baseline estimate of 9.82 per cent.
- Surveys: recent market practitioner surveys produced a mean of 7.9 per cent and a median of 6.2 per cent.

[139] ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 31.

[140] AER, *Rate of Return Annual Update,* December 2020, pp. 14-16.

10.3.2.2 Regulatory developments

307. The AER commenced a review of the market risk premium as part of its 2022 rate of return instrument review.[141]

308. As part of its review the AER commissioned new consultant reports and other papers regarding the market risk premium. These new reports included:

- A review of international rate of return approaches by the Brattle Group that examined eight regulators in six countries.
- Brattle found that three of the eight regulators used historic excess returns, three used the Wright approach, the Federal Energy Regulatory Commission in the United States used dividend growth models and the New Zealand Commerce Commission used a combination of approaches.[142, 143]
- Some regulators use a mixture of approaches to set their market risk premium. Therefore, the assumed interrelationship between the market risk premium and the risk free rate depends on the amount of weight applied to each methodology.
- Brattle suggested that a reliance on the historic Ibbotson method was not as effective as the approaches of other regulators.[144]
- An AER working paper on CAPM and alternative return on equity models.[145]
- A Partington and Satchell expert report on return on equity models.[146]
- Partington and Satchell's report discussed the Wright approach, which assumes a stable total market return and perfect negative correlation between the risk free rate and the market risk premium.[147]
- Partington and Satchell stated that they found this implausible as this could result in negative market risk premiums.[148]
- A review of the relationship between the market risk premium and risk free rate by Cambridge Economic Policy Associates (CEPA).[149] The CEPA report adds additional evidence to this consideration in the form of summaries of academic work, financial practice, regulatory use and some preliminary econometric analysis.
- International regulators examined by CEPA do not rely on an estimate of the market risk premium that is wholly or even substantially based on the historic average of the realised market risk premium.[150]

---

141 AER, *Equity Omnibus Draft working paper,* July 2021.

142 Brattle Group, *A Review of International Approaches to Regulated Rates of Return*, June 2020, pp. 43-44.

143 The Wright approach is an alternative specification of the Sharpe-Lintner CAPM. In the Wright approach, the market risk premium is not an individual parameter, rather it is defined as the difference between the return on equity estimate and the prevailing risk free rate. The Wright approach assumes an inverse relationship between the market risk premium and the risk free rate.

144 Brattle Group, *A Review of International Approaches to Regulated Rates of Return*, June 2020.

145 AER, *CAPM and alternative return on equity models,* December 2020.

146 Partington, G. and Satchell, S., *Report to the AER: Alternative Asset Pricing Models,* June 2020.

147 Partington, G. and Satchell, S., *Report to the AER: Alternative Asset Pricing Models,* June 2020, p. 23.

148 Partington, G. and Satchell, S., *Report to the AER: Alternative Asset Pricing Models,* June 2020, p. 23.

149 CEPA, *Relationship between RFR and MRP*, June 2021.

150 CEPA, *Relationship between RFR and MRP*, June 2021, p. 5.

- CEPA suggested that there was preliminary evidence of a negative relationship between implied market risk premiums from dividend growth estimates and earnings yields with the risk free rate.[151]
- CEPA stated:[152]

> Our assessment is that (i) there is acceptance that MRP is not stable and (ii) it is possible that there is an inverse relationship between the forward looking MRP and the RfR, and (iii) there is no good evidence that the MRP should be assumed to be independent of the RfR, the current implicit assumption of the AER's approach, and (iv) there is no conclusive theoretical basis for an assumption of independence or dependence.
>
> In judging evidence on MRP using historic data, the AER can choose whether to use:
>
> - An assumption that the MRP is fixed (current approach)
> - An assumption that the TRMR is stable ("Wright approach")
> - An approach that has regard to both measures. This could be for example a weighted average of the two measures that assumes that the MRP is related to the RfR, but the relationship is not one to one.

- An AER working paper on rates of return in a low interest rate environment.[153] This paper sought comments on whether a low interest rate environment necessitated changes in the market risk premium. The AER deferred a preferred position until their final equity omnibus working paper.[154]

309. From its review of the market risk premium, as detailed in its draft working paper, the AER:

- Has continued to support historical excess returns as a primary model for market risk premium estimation. Using historical excess returns does not mean that the market risk premium is backward-looking. Historical excess return data is commonly used in both regulation, and by market practitioners to inform their estimates of the market risk premium within a forward-looking rate of return.[155]
- Has continued to use both arithmetic and geometric annual averages in estimating the market risk premium.[156]
- Has noted concerns with the dividend growth model and sought stakeholder proposals on how the estimate of the market risk premium could be improved by employing dividend growth models.[157]
- Has not finalised a position on the market risk premium and continues to assess evidence of a relationship between the risk free rate and the market risk premium. The AER noted that for the purposes of regulatory use, the relationship it is most interested in would have to exist between the parameters in an *ex ante* sense for both the parameters.[158]

---

151 CEPA, *Relationship between RFR and MRP*, June 2021, p. 6.

152 CEPA, *Relationship between RFR and MRP*, June 2021, pp. 6-7.

153 AER, *Term of the rate of return & Rate of return and cashflows in a low interest rate environment: Final working paper*, September 2021.

154 AER, *Term of the rate of return & Rate of return and cashflows in a low interest rate environment: Final working paper*, September 2021, pp. 101-102.

155 AER, *Equity Omnibus Draft working paper,* July 2021, pp. 21-22.

156 AER, *Equity Omnibus Draft working paper,* July 2021, p. 24.

157 AER, *Equity Omnibus Draft working paper,* July 2021, pp. 24-25.

158 AER, *Equity Omnibus Draft working paper,* July 2021, p. 35.

310. The Queensland Competition Authority reviewed its market risk premium approach following a review of its rate of return method in 2021. The Queensland Competition Authority's new approach can be summarised by the following: [159]

- Discontinuation of the Wright, Siegel and survey methods.
- Preference for the Ibbotson historical market risk premium method, with data post 1958.
- An adjustment to the overall cost of equity if economic conditions justify changes.

10.3.3 2022 initial position

311. The ERA's working view for the 2022 gas instrument is that a market risk premium of 6.0 per cent should be maintained. The market risk premium will remain fixed for the life of the gas instrument.

10.3.3.1 Historical excess returns

312. The ERA estimates a historic market risk premium of 5.7 per cent:

- The ERA estimates the historic market premium using current data and the approach detailed in the 2018 gas rate of return instrument.
- The historic market risk premium can be directly measured. The Ibbotson approach is a well-accepted method for calculating the market premium using historic data.
- The ERA's estimate takes the average of the lowest arithmetic mean (6.11 per cent) and the highest geometric mean (5.20 per cent) to develop an estimate of the historic market risk premium of 5.7 per cent.

313. The ERA is considering simplifying its existing market risk premium approach driven by data quality concerns and the representativeness of long-dated historical returns. The ERA considers that these changes will make it easier for all stakeholders to replicate its approach.

Sampling periods

314. The ERA will estimate the market risk premium using the Ibbotson method, which requires the selection of a time period to analyse historical data over.

315. The length of the estimation window involves a trade-off between relevance of the data and statistical robustness.

- Longer periods can include behaviour in the data that is no longer relevant due to changing economic and market conditions.
- However, shorter periods may produce estimates that are less statistically robust.

316. The 2018 gas instrument used six overlapping time periods:

- 1883 to current: the longest available time period.
- 1937 to current: includes data from the Sydney All Ordinary Shares price index that was retrospectively calculated.

[159] QCA, *Final Report: Rate of return review*, November 2021, pp. 55-65.

- 1958 to current: includes data with the daily calculation of the Sydney All Ordinary Shares price index.
- 1980 to current: includes data from the Australian Securities Exchange (ASX) All Ordinaries index.
- 1988 to current: includes data after dividend imputation was introduced.

317. The ERA used five sampling periods to calculate the market premium to reflect different economic conditions. The dates of four of the selected sampling periods (1883, 1937, 1958 and 1980) reflected changes to the quality of the underlying data, while the other period reflected changes to the tax system (the introduction of the imputation tax system in 1988).[160]

318. In the 2018 gas instrument review, the ERA also considered the 2000 to current sampling period, which reflected the change of the Goods and Services Tax in 2000. At the time, the ERA considered that the 2000 to 2017 period was too short, so did not include this period for the purposes of calculating the historic market risk premium.[161]

319. The ERA is considering adjusting its sampling periods to better reflect forward expectations and simplify its process.

- The historical returns from over 100 years ago may not be relevant to future expected returns as significant market and economic changes have occurred during the period from 1883 to the present that introduce the likelihood of structural breaks that are only partially accounted for by the discrete time periods used.
- Concerns about data quality for returns pre-1932 have been raised by the AER and Pink Lake Analytics.[162, 163]
- The dividend component of total returns estimated pre-1958 could have been overstated due to methodological issues from an equal weighting approach.[164]

320. The ERA's working view for the 2022 gas instrument is to have regard to more recent time periods and use post-1958 data. For the estimation of the market risk premium for the 2022 gas instrument the ERA will use the following three overlapping periods:

- 1958 to current
- 1980 to current
- 1988 to current.

321. The ERA is giving further consideration to the introduction of an additional period from 2000 that reflects the introduction of the Goods and Services Tax.

160 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement,* December 2018, p. 177.

161 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement,* December 2018, p. 197.

162 AER, *Rate of return instrument, Explanatory statement*, December 2018, pp. 240-244, 247-249.

163 Pink Lake Analytics, *Estimation of the Market Risk Premium*, December 2017, pp. 7-9.

164 AER, *Equity Omnibus, Draft working paper*, July 2021, p. 22.

322. The 2018 gas instrument utilises two datasets from BHM and NERA.

- BHM have produced the furthest backdated source of historical equity risk premium data for Australia. BHM's data series is, in part, based on a series constructed by Lamberton and the Sydney Stock Exchange (now the ASX).[165]
- In 2013, NERA raised concerns about the possibility of a downward bias in some of the older data observations in this dataset and produced an adjusted version of the BHM data.[166]

323. The NERA and BHM datasets prior to 1958 produce some different numbers. However, after 1936 the NERA and BHM datasets produce similar estimates.

324. The AER solely relies on the BHM dataset as it recognised that relatively few adjustments separated the two datasets and that the more recent periods converged.[167]

325. The ERA's working view for the 2022 gas instrument is to simplify its method through the sole use of the BHM dataset to estimate the historic market risk premium:

- With the ERA's move to data post-1958, both the BHM and NERA data converges, which makes the NERA dataset redundant.
- Given that BHM is the original dataset, the ERA proposes to solely use the BHM dataset for the purposes of estimating the market risk premium.

Question 9

When estimating the historical market risk premium do you support the use of sampling periods post-1958? If not, please explain why and your alternative approach.

Question 10

When estimating the historical market premium do you support expanding the sampling periods to include a new period of 2000 to current? If not, please explain why and your alternative approach.

Question 11

When estimating the historical market premium do you support the approach to only consider the Brailsford, Handley and Maheswaran (BHM) dataset? If not, please explain why and your alternative approach.

165 Brailsford, T., Handley, J. and Maheswaran, K., *'Re-examination of the historical equity risk premium in Australia'*, Accounting and Finance, Vol. 48, 2008, pp. 78-79.

166 NERA, *The market size and value premiums*, June 2013.

167 AER, *Rate of return instrument, Explanatory statement*, December 2018, pp. 248-249.

Averaging method

326. The ERA's working view for the 2022 gas instrument is to retain the use of arithmetic and geometric means when calculating the historical market risk premium.

327. The expected market risk premium in the Sharpe-Lintner CAPM is expressed as an annualised return. There are two averaging methods which can be used to derive an annualised return — the arithmetic and geometric average.[168]

328. The 2018 gas instrument calculated the historic market premium through:

- Arithmetic and geometric averages of the historic market premium observations are calculated using the BHM and NERA datasets.
- Five overlapping time periods (1883-2017, 1937-2017, 1958-2017, 1980-2017 and 1988-2017) are used for averaging periods, to reflect different economic conditions.
- A simple average of the lowest arithmetic and highest geometric means of the produced historic market premium matrix is then used to estimate the historic market risk premium.

329. The 2018 gas explanatory statement details the ERA's consideration for the averaging method for the 2018 gas instrument. An arithmetic average will tend to overstate returns, whereas a geometric average will tend to understate them. The ERA sought to minimise the error with over-reliance on one of the two types of averages by continuing the 50/50 weighting of the arithmetic and geometric means.[169]

330. For the 2022 gas instrument the ERA continues to consider that an unbiased estimate of the historic market risk premium is likely to be somewhere between the geometric average and arithmetic average.

331. For the 2022 gas instrument when calculating the historic market premium, the ERA will continue to take a simple average of the lowest arithmetic and highest geometric means of the produced historic market premium matrix.

332. The ERA is further considering a possible option of simplifying how it considers the arithmetic and geometric means in the produced historic market premium matrix. One approach would be to take the average of the arithmetic means and average of geometric means and calculate the simple average.

---

[168] The arithmetic mean is also called the simple average, which is the sum of all numbers in the series divided by the count of all numbers. The arithmetic mean formula is:

$$Arithmetic\ Mean = \frac{\sum_{i=1}^{n} x}{n} = \frac{x_1 + x_2 + \cdots + x_n}{n}$$

The geometric mean is the average of a set of products. The geometric mean formula is:

$$Geometric\ Mean = \left(\prod_{i=1}^{n} x\right)^{\frac{1}{n}} = \sqrt[n]{x_1 \cdot x_2 \cdots x_n}$$

When geometric mean works with percentage returns, the formula is altered to reflect the compounding effect, as below:

$$Geometric\ Mean\ for\ \%\ return = \sqrt[n]{(1 + x_1\%) \cdot (1 + x_2\%) \cdots (1 + x_n\%)} - 1$$

[169] ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, pp. 197-201.

333. The ERA considers that this approach would have the following advantages:

- Greater utilisation of all the sample periods, whereas the minimum/maximum method takes into account only two periods.
- Does not result in a potential mismatch between the time periods that are chosen with the minimum/maximum approach for the arithmetic and geometric means.
- Through the incorporation of overlapping periods, places more weight on more recent term data.

334. The ERA considers that this approach provides less consideration to the range of observed arithmetic and geometric means.

Question 12

When estimating the historical market premium do you support the approach to calculate the historic market risk premium through the average of the arithmetic and geometric means? If not, please explain why and your alternative approach.

Historic market premium estimate

335. The following table details the ERA's estimates of the historic market premium.

Table 5: Proposed historical market risk premium (with a 5 year risk free rate) (%)

Time period	Arithmetic mean	Geometric mean
1958-2020	6.96	4.74
1980-2020	6.87	4.76
1988-2020	6.57	5.10
Historical market risk premium	**5.8**	

Source: ERA Analysis

336. Based on the ERA's working view on the approach for the 2022 gas instrument, the ERA takes the average of the lowest arithmetic mean (6.57 per cent) and the highest geometric mean (5.10 per cent) to develop an estimate of the historic market premium of 5.8 per cent.

10.3.3.2 Dividend growth model

337. The ERA's working view is to maintain the use of the dividend growth model to estimate the market risk premium.

338. The dividend growth model uses an assumed forecast dividend growth rate, an assumed forecast future growth rate and current share prices to estimate the market risk premium. This forward-looking discount rate is the implied market return on equity.

339. The ERA will continue to use the two-stage dividend growth model to estimate the market risk premium as a secondary consideration. The two-stage model assumes that dividends grow at the long-term growth rate following the dividend forecast period. The ERA's dividend growth model estimate will retain a growth rate from Lally of 4.6 per cent. The ERA is further considering whether the long-term growth rate provided by Lally is still appropriate given current market conditions.

340. While the dividend growth model has the benefit of taking the current economic outlook into account, it is unreliable on its own. The dividend growth model suffers from some weaknesses including the form of the model, its input assumptions, its sensitivity to assumptions and its upward bias. The ERA holds concern with the use of the dividend growth model and does not place a large reliance on the model's market risk premium estimate.

341. The ERA estimates a market risk premium of 8.1 per cent from the dividend growth model.

10.3.3.3 Conditioning variables

342. For the 2022 gas instrument the ERA's working view is to maintain its consideration of conditioning variables.

343. Conditioning variables are readily available market data which allow the ERA to take into account current market conditions. The ERA considers conditioning variables as part of its determination of a point estimate for the market risk premium.

344. The ERA will consider conditioning variables including:

- The AA bond five-year default spread, which provides the spread between AA Australian Corporate Bloomberg Fair Value Curve and a Commonwealth Government bond.
- The five-year interest rate swap spread, which provides the spread between the interest rate swap rate and a Commonwealth Government bond.
- Market dividend yields, which provide the All Ordinaries dividend yield as a ratio of dividends to the portfolio price.
- Implied market volatility, which is measured through the ASX 200 volatility index.

345. The ERA will consider the current levels of conditioning variables relative to their historic averages and how these market conditions affect the market risk premium.

346. Each of these conditioning variables is presented in the following charts.

Figure 3: Five-year AA bond default spread and Five-year interest rate swap

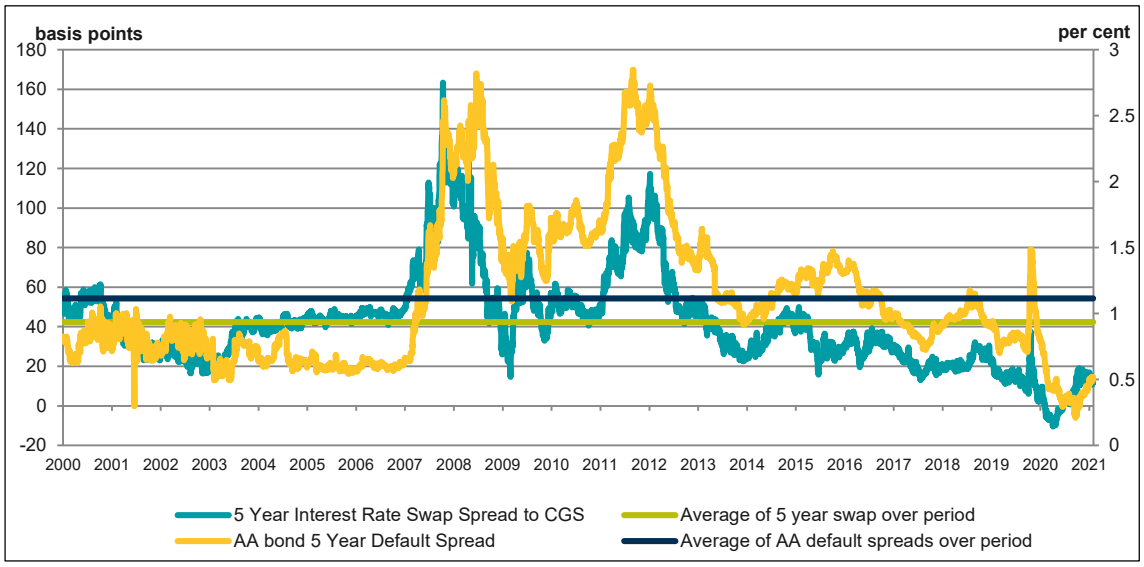


Figure 4: All Ordinaries Index annual dividend yield

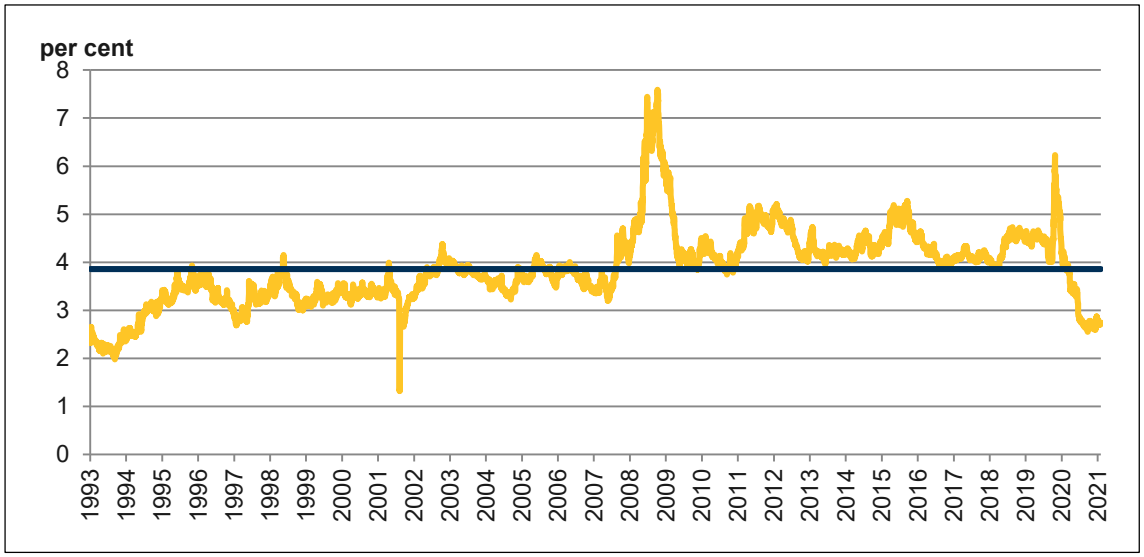
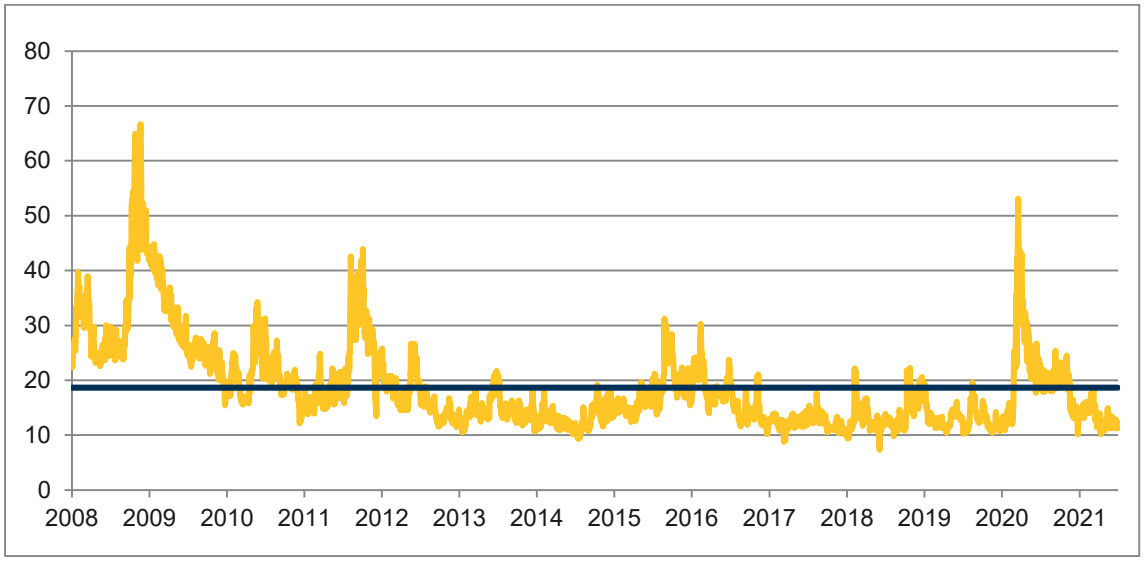


Figure 5: Implied Volatity (ASX200 VIX)



347. On balance, the ERA considers that the conditioning variables are currently below their historic averages and support a market risk premium at the lower end of its range.

10.3.3.4 Determination of point estimate

348. The ERA's proposed market risk premium approach for the 2022 gas instrument:

- Places more reliance on the historic market risk premium, relative to the dividend growth model.
- Determines a final point estimate of the market risk premium by using regulatory judgement, including considering conditioning variables. The final point estimate of the market risk premium would be rounded to one decimal place.

349. On the basis of all available information, together with its regulatory discretion, the ERA estimates a market risk premium of 6.0 per cent for the 2022 gas instrument.

350. The market risk premium will remain fixed for the life of the gas instrument.

10.3.3.5 Relationship between the market risk premium and the risk free rate

351. To form its working view on the market risk premium, the ERA has given further consideration to the relationship between the market risk premium and the risk free rate.

352. Disagreement regarding the relationship between the market risk premium and the risk free rate is not new, and was considered as part of the 2018 gas instrument.

353. Any method used to estimate the market risk premium will result in an implicit assumption regarding the relationship between the market risk premium and the risk free rate. The three possibilities are that the relationship is either positive, negative or that there is no relationship.

354. This relationship also affects the broader relationship between the return on equity and the risk free rate.

355. The ERA has previously examined this relationship. Stakeholders have proposed alternative approaches such as the Total Market Return method (or the Wright method), which implies a negative relationship between the market risk premium and the risk free rate.

356. The ERA has not previously accepted the Wright method, along with its implied negative relationship. This was most recently discussed in the 2018 gas explanatory statement.[170] Advice from Partington and Satchell indicated that the Wright approach:

- Has "no support based on any clear evidence in the Australian context."[171]
- "Runs contrary to the well accepted view that asset prices are inversely related to interest rates."[172]

---

170 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, pp. 168-170.

171 Partington, G. and Satchell, S., *Report to the AER: Discussion of estimates of the return on equity*, April 2017, p. 28.

172 Partington, G. and Satchell, S., *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 31.

357. On this basis, for the 2018 gas instrument, the ERA:

- Determined the market risk premium at a point in time for the start of the gas instrument using the Ibbotson historical method, the dividend growth model and conditioning variables.
- Fixed the market risk premium for the term of the instrument, and therefore the market risk premium does not change with the risk free rate.

358. The ERA is aware that the Queensland Competition Authority has used the Wright method for its market risk premium estimation.

359. However, in its recent 2021 rate of return review, the Queensland Competition Authority indicated that it would no longer use the Wright method. Instead, the Queensland Competition Authority's market risk premium approach is for:

- A preference for using the Ibbotson historical method as the basis for setting the market risk premium.[173]
- Only using the dividend growth model to provide directional guidance when considering the overall cost of equity, not for directly estimating the market risk premium.[174]

360. With regard to the relationship between the market risk premium and the risk free rate, the Queensland Competition Authority made the following observations:[175]

- That the market risk premium is unlikely to be perfectly stable over time, but it is also unlikely to be perfectly negatively correlated with the risk free rate over time.
- In Australia "there is little empirical evidence to support a direct and constant relationship between the risk free rate and the market risk premium."
- The Queensland Competition Authority's analysis suggested that the "market risk premium for Australia is likely to be relatively more stable over time than the return on equity."
- Noted that Wright's method was based on United States data, which may not apply to the Australian market.

361. The Queensland Competition Authority considered that the lack of empirical evidence supporting a strong negative relationship between the risk-free rate and the market risk premium for Australia made it difficult to justify the use of the Wright method.

- However, the Queensland Competition Authority did note that there could be instances where the market risk premium could increase as the risk free rate decreases.
- The Queensland Competition Authority considered that in these situations it preferred to adjust the overall cost of equity rather than adjust the market risk premium.[176]

362. The AER has considered new evidence on the relationship between the market risk premium and the risk free rate in its 2022 rate of return instrument review.[177]

---

173 QCA, *Final Report: Rate of Return Review*, November 2021, p. 59.

174 QCA, *Final Report: Rate of Return Review*, November 2021, p. 62-64.

175 QCA, *Draft Report: Rate of Return Review,* July 2021, pp. 51-52.

176 QCA, *Final Report: Rate of Return Review*, November 2021, pp. 18, 51.

177 AER, *Rate of Return Equity Omnibus Draft Working Paper*, July 2021, pp. 28-37.

363. The AER had previously examined the relationship when determining its 2018 rate of return instrument. At that time, stakeholders put forward a diverse range of views and the AER commissioned expert evidence to evaluate the various submissions. As part of that process, Partington and Satchell suggested that there was no evidence to support the application of the Wright approach in an Australian context.[178]

364. Academic evidence evaluated by the AER was inconclusive, ranging from:

- A positive relationship.[179]
- No relationship, as the market risk premium and the risk free rates are jointly determined.[180]

365. Professional practice examined by the AER was considered to be unsupportive of the Wright method being used in financial markets.[181]

366. More recently as part of its 2022 rate of return instrument review, the AER engaged various experts to re-examine the relationship between the market risk premium and the risk free rate. The key findings can be summarised as:

- The Wright method can result in implausible outcomes, especially when the risk free rate is above the historical average market return, which implies a negative market risk premium.[182]
- The findings from the CEPA report discussed in Chapter 10.3.2.
    - The possibility of an inverse relationship between the forward-looking market risk premium and the risk free rate.
    - No good evidence that the market risk premium should be assumed to be independent of the risk free rate.
    - No conclusive theoretical basis for an assumption of independence or dependence.

367. The AER evaluated these reports and remained cautious on the relationship between the market risk premium and the risk free rate. In its working paper, the AER concluded:[183]

- International regulators place various degrees of weight to the Wright method, suggesting that there is not a full acceptance of a negative relationship.
- The econometric analysis that underpins support for a negative relationship is reliant on dividend growth model estimates. It is difficult to draw inferences from such analyses when the underlying dividend growth model estimates are subject to the various issues identified previously by the ERA and AER. Therefore, there are questions on how effective is the dividend growth model in representing *ex ante* expectations.

178 Partington, G. and Satchell, S., *Report to the AER: Discussion of Estimates of the Return on Equity*, April 2017, p. 28.

179 AER, *Discussion paper Market Risk Premium, risk free rate averaging period and automatic application of the rate of return,* March 2018.

180 Abel, A., *Equity Premia with Benchmark Levels of Consumption: Closed-Form Results*, June 2006.

181 AER, *Rate of return instrument Explanatory Statement*, December 2018, p. 86.

182 Partington, G. and Satchell, S., *Report to the AER: Alternative Asset Pricing Models*, June 2020, p. 23.

183 AER, *Rate of Return Equity Omnibus Draft Working Paper*, July 2021, pp. 31-35.

- CEPA acknowledged that its analysis may not be suitable for regulatory purposes, but could be a useful directional indicator.
- The relationship appears unstable and in the absence of a well understood economic theory or logic it would be difficult to predict what the expected relationship should be in a robust manner.

368. The AER has not settled its position on this the relationship between the market risk premium and the risk free rate. The AER noted that any approach adopted must be sufficiently robust, transparent and evidence based to be suitable for regulatory purposes. It must also be done on an *ex ante* basis due to the nature of the regulatory task.[184]

369. The AER sought stakeholder views on the relationship between the market risk premium and the risk free rate. Stakeholders and experts provided evidence and views for and against a negative relationship between the market risk premium and the risk free rate.

370. The AER Consumer Reference Group noted that this matter has been traversed multiple times without resolution.[185] It reviewed the evidence provided to date, found it to be still inconclusive and expressed deep reservations as to whether this matter could ever be solved scientifically. It preferred that this matter to be considered closed until conclusive evidence can be provided either way.

371. The ERA's understanding of the relationship between the market risk premium and the risk free rate can be summarised as:

- From a conceptual analysis, it appears that the risk free rate and the market risk premium are jointly determined financial primitives.[186] A relationship between the two is unclear given that the covariance between the risk free asset and all other assets is presumably zero in expectation. However, causality (if any) would likely flow from the risk free rate to the market return.
- Empirical evidence appears to support a volatile, time-varying relationship that does not appear to be predictable. The academic evidence tends to be focused on US data, which may not reflect Australia.
- Proposed theoretical explanations for the relationships do not appear to be widely accepted as orthodox explanations. Ideally a mathematical theory based on general equilibrium principles or structural modelling could provide the comparative statics to explain the cause and change for the relationship.
- The evidence based on dividend growth model estimates is only useful to the extent that the dividend growth model provides plausible estimates. Otherwise, a joint hypothesis like problem is present regarding the inference of such econometric analysis.
- The relevant relationship is that of the *ex ante* market risk premium to the *ex ante* risk free rate. It does not appear that the analysis of empirical *ex ante* estimates of this relationship are robust.

---

184 AER, *Rate of Return Equity Omnibus Draft Working Paper*, July 2021, p. 35.

185 CRG, *CRG Response to the AER's July 2021 Draft Working Papers – Volume 1*, September 2021, p. 81.

186 Certain parameters of the Sharpe-Lintner CAPM are exogenous and are not produced or explained by the model. In this sense they act as financial primitives (alternatively, primitive securities), the base building blocks of the model. They are jointly determined in the sense that the risk free rate and market return are set simultaneously.

372. One possible way to account for a negative relationship would be to provide some weight to the Wright approach along with the historical market risk premium, something that the ERA did not accept for the 2018 gas instrument.

373. After considering the additional information discussed above, the ERA's working view is to maintain its position in the 2018 gas instrument.[187]

374. The ERA considers this matter is a contested area of finance. As such, any changes to its existing regulatory practice must be justified with theory, evidence and consultation with stakeholders.

375. The ERA will not change its existing regulatory practice if it does not have confidence in a method that will adjust for the predicted relationship between the market risk premium and the risk free rate. As the observed correlations between the risk free rate and market risk premium are very volatile, it is not clear that such an adjustment is feasible, or whether such volatility will persist in the future.

376. The ERA notes that the market risk premium is reset every four years under the ERA's requirement to review the gas instrument. These reviews evaluate the latest evidence on this matter and sets an expected return.

377. The ERA will continue to review regulatory developments on the relationship between the *ex ante* market risk premium and *ex ante* risk free rate.

378. The ERA invites submissions on this relationship between the market risk premium and the risk free rate.

[187] ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, p. 170.

Question 13

When estimating the market risk premium do you support the current approach of estimating and considering the market risk premium and the risk free rate independently from one another? If not, please explain why and your alternative approach. Specifically, the ERA is interested in:

- The empirical relationship (magnitude and direction) between the *ex ante* market risk premium and the *ex ante* risk free rate in Australia and the conceptual logic underpinning such a relationship.
- Whether the relationship is sufficiently stable and persistent (that is, not volatile and transitory) on an *ex ante* basis.
- Ways in which the relationship can be implemented to estimate the market risk premium in a manner suitable for regulatory purposes.

10.4 Equity beta

379. Risk is the degree of uncertainty about an event, for example the uncertainty around an investment's expected returns. This is a forward-looking concept. The risk-return trade off in finance theory provides that a risk averse investor will want a higher expected return when faced with higher risk.

380. The risk of an asset is typically thought of as the variance in asset returns. Total risk consists of systematic and non-systematic risk. Systematic risk is that part of total risk in a firm's returns that stems from the economy and markets more broadly. Systematic risk cannot be eliminated through diversification. Non-systematic risk is the risk stemming from unique attributes of the firm, which may be eliminated by an investor through diversification. For this reason, only systematic risk is compensated by the return on equity.

381. The equity beta is a parameter that measures the systematic risk of a security or a portfolio in comparison to the market as a whole.

382. Equity beta is the slope parameter β_i in the Sharpe Lintner CAPM. The slope parameter β_i correlates a specific asset's return in excess of the risk free rate of return, to movements in the return on the market portfolio:

$$R_i = R_f + \beta_i (R_M - R_f) \qquad \text{(equation 6)}$$

where:

R_i is the required rate of return on equity for the asset, firm or industry in question

R_f is the risk free rate

β_i is the equity beta that describes how a particular portfolio *i* will follow the market which is defined as $\beta_i = cov(R_i, R_M)/var(R_M)$

$(R_M - R_f)$ is the market risk premium.

383. Two risk factors are generally considered to estimate the value of equity beta for a particular firm:

- The type of business, and associated capital assets, that the firm operates measured by asset or "un-levered" beta.
- The amount of financial leverage (gearing) employed by the firm which levers or "amplifies" the asset beta to arrive at equity beta.

384. This section outlines the ERA's working view on the approach to estimating equity beta that should be applied in the 2022 gas instrument.

10.4.1 2018 position

385. The 2018 gas instrument applied an equity beta of 0.7, which was fixed over the period of the instrument.[188]

386. The equity beta estimate set out in the 2018 gas instrument was determined by applying the methods set out in Henry's advice to the Australian Competition and Consumer Commission in 2009.[189]

387. Henry's analysis used various time periods over which the data for equity beta estimation was observed. This included the longest available period, the post-tech boom excluding the global financial crisis and the five years preceding the analysis.[190]

388. The ERA considered that a five-year period with weekly returns for the equity beta balanced the trade-offs between relevance of the data and statistical robustness whilst being consistent with the regulatory reset period.[191]

389. The ERA estimated equity beta using the All Ordinaries Index and a sample of benchmark firms.

390. The ERA applied the Brealey-Myers formula with a zero debt beta to de-lever and re-lever the equity beta using the average gearing ratio of the same five-year period to the benchmark gearing level of 55 per cent.[192]

391. The 2018 made no adjustment for low beta bias.[193]

392. The ERA's analysis using available data produced an equity beta of 0.7.[194]

188 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 34.

189 Henry, O, *Estimating Beta: Advice Submitted to the Australian Competition and Consumer Commission*, April 2009.

190 Henry, O, *Estimating beta: An update*, April 2014, p. 4.

191 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 34.

192 ERA, *Final Gas Rate of Return Explanatory Statement,* December 2018, p. 219.

193 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 34.

194 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 34.

10.4.2 Developments since 2018 instrument

10.4.2.1 Market developments

393. The AER's 2020 annual rate of return update has produced a range of equity beta estimates for remaining listed domestic energy firms from 0.4 to 0.7. [195]

Market volatility

394. Financial markets have been volatile and affected by COVID-19, particularly during February and March 2020.

- This impact was largely negative, with increased market volatility as the effects of the pandemic were felt in both the real and financial economy.
- However, towards the end of the 2020 there was a recovery to pre COVID-19 levels for the market.

395. As equity beta is calculated through the observed covariance of the market return and an individual stock or portfolio, it is likely that COVID-19 may affect measured systematic risk due to the increased volatility:

- The extent of these effects depends on the co-movement of the company and market returns.
- It is likely that pre COVID-19 betas are materially different to post COVID-19 betas due to differential industry effects and market reactions to COVID-19.

396. A conceptual analysis would indicate that essential services such as energy networks would have been relatively more immune from COVID-19, compared to other industries.

Acquisitions

397. Listed regulated and long-term infrastructure businesses have been actively sought after and acquired. In 2021 there were takeover bids for both Spark Infrastructure and Ausnet.[196] [197]

398. This means that the domestic energy sample used in the 2018 gas instrument may substantially reduce from 2021 onwards. If the takeovers are successful, there may only be one remaining listed firm (APA Group) from 2022 onwards.

399. This reduction in listed domestic comparators would affect the equity beta estimation sample given that it reduces the number of active firms to a single firm:

- However, this situation is similar to the situation for the 2018 gas instrument. While two firms may be recently delisted, they still have a meaningful number of observations for analysis.
- APA Group may also be a takeover target in the future, given investor interest in infrastructure assets.

---

195 AER, *Rate of Return Annual Update,* December 2020, p. 11.

196 AusNet Services, *Foreign Investment Review Board approval received in relation to proposed Scheme*, online.

197 Spark Infrastructure, *Scheme Booklet in relation to the proposed acquisition of Spark Infrastructure*, online.

400. These acquisition announcements may have affected historic share prices and may not be indicative of changes in systematic risk:

- The timing of takeover announcements themselves may influence equity beta due to speculation and have implications of pricing once the acquisitions are complete.
- In addition, the price of APA Group, the one energy business not yet acquired, may have been affected by its active takeover offer for AusNet.

10.4.2.2 Regulatory developments

401. The New South Wales Independent Pricing and Regulatory Tribunal reviewed its equity beta approach in 2020. The approach can be summarised as:,[198]

- Including international firms in the estimation.
- Using weekly data and all five possible reference days.
- Using ordinary least squares as the preferred regression technique with a Vasicek adjustment.[199]
- Using a materiality and persistence test before it made a change to equity beta. Before revising any established beta value, it must be more than one standard deviation from the mean of the current sample and there is persistent evidence of a changed beta.
- Making no adjustment for low beta bias.

402. The AER is examining the equity beta as part of its 2022 rate of return instrument review. In 2021 the AER published its equity omnibus paper, consolidating the thinking and reasoning for the proposed 2022 Instrument approach.[200]

403. The AER has commissioned new consultant reports for equity beta, including:

- A review of international rate of return approaches by the Brattle Group where it examined eight regulators in six countries. Brattle found that international regulators tended to use international samples and shorter estimation windows.[201]
- A review of equity beta estimation for Australian energy networks by Economic Insights. This report detailed considerations required in estimating the Sharpe-Lintner CAPM, including:[202]
  - Estimation period and implications of recent market developments.
  - The firm comparator set.

198 IPART, *Estimating Equity Beta for the Weighted Average Cost of Capital, final report*, August 2020.

199 The Vasicek adjustment modifies the ordinary least squares equity beta towards a prior beta estimate, with the degree of the adjustment based on the standard error of the regression estimates. Under this approach estimates that have higher certainty receive higher weight. See Vasicek, O., *A Note on Using Cross-Sectional Information in Bayesian Estimation of Security Betas*, Journal of Finance, Vol. 28, No. 5, December 1973, pp 1233-1239.

200 AER, *Rate of Return – Equity Omnibus, Draft working paper*, July 2021.

201 Brattle Group, *A Review of International Approaches to Regulated Rates of Return*, June 2020.

202 Economic Insights, *Methodological issues in estimating the equity beta for Australian network energy businesses,* June 2021.

404. The AER's preliminary position on equity beta, as detailed in its draft working paper, can be summarised as:[203]

- The retention of nine Australian firms to estimate beta, which include delisted firms.[204]
- The view that these firms reflected firms most comparable to an Australian regulated energy network.
- The view that de-listed firms carry useful information and systematic risk for firms supplying Australian regulated energy networks are relatively stable and change slowly.
- The consideration of removing firms that have been delisted for a significant period of time. The AER observed that other regulators, such as Ofwat and Ofgem, use small domestic samples.[205]
- Recognition that there are difficulties with including international firms in its comparator set and that international firms could be used as a cross check for empirical estimates.[206]
- Recognition that the inclusion of international firms may bias estimates, due to non-comparability to Australian energy service providers due to regulatory, market, structural and operational differences.[207]
- Recognition that the Sharpe-Lintner CAPM used by the AER creates a strong preference to use domestic firms and a domestic index. The use of international firms with an international index does not measure systematic risk relative to the Australian domestic market portfolio.[208]
- The continued use of the methods in the 2018 instrument to estimate equity beta.[209]
- Use of the Sharpe-Lintner CAPM instead of methods involving "low beta bias" or the Black method.
- Ordinary Least Squares as the primary estimator, with the Least Absolute Deviations (LAD) estimator as a robustness check for outliers.
- The use of two estimation periods, one being the longest period available and the other using five years of data. The AER proposes to place more weight on the longest estimation window which are more statistically reliable, include entire market cycles and better match the long-term nature of assets.[210]

405. The AER is still actively considering equity beta methods and seeking further stakeholder views.[211]

203 AER, *Rate of Return – Equity Omnibus, Draft working paper*, July 2021, pp. 41-44.
204 AER, *Rate of Return – Equity Omnibus, Draft working paper*, July 2021, p. 41.
205 AER, *Rate of Return – Equity Omnibus, Draft working paper*, July 2021, p. 41.
206 AER, *Rate of Return – Equity Omnibus, Draft working paper*, July 2021, pp. 42-43.
207 AER, *Rate of Return – Equity Omnibus, Draft working paper*, July 2021, p. 41.
208 AER, *Rate of Return – Equity Omnibus, Draft working paper*, July 2021, p. 41.
209 AER, *Rate of Return – Equity Omnibus, Draft working paper*, July 2021, p. 43.
210 AER, *Rate of Return – Equity Omnibus, Draft working paper*, July 2021, p. 43.
211 AER, *Rate of Return – Equity Omnibus, Draft working paper*, July 2021, pp. 43-44.

406. The Queensland Competition Authority reviewed its equity beta approach following a review of its rate of return method in 2021.[212] Its new approach can be summarised by the following:

- includes international firms in their estimation
- uses an estimation window of 5-10 years using weekly data
- uses ordinary least squares as the preferred regression technique
- makes no adjustment for low beta bias.

10.4.3 2022 initial position

407. The ERA has further considered its approach to estimating equity beta for the 2022 gas instrument.

408. The ERA's working view for the 2022 gas instrument is to use an equity beta of 0.7. The equity beta will remain fixed for the life of the gas instrument.

10.4.3.1 Benchmark sample

409. The ERA's 2018 gas instrument benchmark sample included the DUET Group, Spark Infrastructure, AusNet Services and the APA Group.

410. The ERA's sample of Australian energy networks is reducing, with DUET already being delisted and Spark Infrastructure and AusNet to be delisted in 2022.

411. The ERA holds some concern with the use of such a small sample, including that:

- A forward-looking equity beta requires live firms that can incorporate information into prices, where historical estimates cannot incorporate information due to being delisted.
- A sample that is largely reflective of one firm deviates from a benchmark approach to an actuals approach.
- A sample largely reflective of one firm also may be statistically unreliable.

412. However, a small domestic sample may still provide useful and reliable equity beta estimates given the nature of energy network service providers.

- This problem was encountered in a more limited way in the 2018 gas instrument with the delisting of the DUET Group.
- As the transactions for Spark Infrastructure and AusNet are still recent, estimating their equity beta would still result in meaningful estimates.
- If the systematic risk of gas network service providers is relatively static or time invariant, then examining historical betas can still reliably provide estimates of the expected equity beta.
- Other regulators have chosen to use small domestic samples.

[212] QCA, *Final Report: Rate of Return Review*, November 2021, pp. 66-82.

413. The ERA is considering how, and if, the benchmark sample needs to change due to market developments. It is currently evaluating options including:

- Maintaining the status quo of using a sample of Australian energy businesses.
- Expanding the domestic sample to also include similar industries to energy networks.
- Expanding to an international sample of energy networks, alongside the existing domestic energy network sample.

Status quo – Australian energy networks

414. Under the status quo option, the proposed method maintains the 2018 gas instrument approach and uses available Australian energy network data.

415. The ERA would estimate equity beta using a combined domestic energy network sample using weekly returns.

416. The firms in the combined energy sample will be:

- APA Group
- AusNet Services (using the last available five years)
- DUET Group (using the last available five years)
- Spark Infrastructure (using the last available five years).

417. The ERA notes that other regulators, such as the AER, Ofgem and Ofwat, have a strong preference for using domestic samples, even with a small sample.

418. The ERA considers that the status quo option has the following advantages:

- The benchmark sample is kept within Australian capital markets and includes the closest, comparable pure-play energy networks.
- The approach is consistent with prior practice, regulatory approach and precedent.

419. The ERA considers that the status quo option has the following disadvantages:

- There will be only one live firm in the near future.
- This business may also be delisted in the future given investor interest in infrastructure assets.
- The APA Group includes unregulated businesses and the group has been diversifying its operations across the supply chain.
- The approach relies heavily on the assumption that energy network service provider equity betas are stable and will not differ in the future from historical estimates.

420. On balance, for the purposes of equity betas the ERA considers that maintaining the Australian energy sample in the near term could be justified.

Expanded domestic sample – Australian infrastructure

421. Under the expanded domestic sample option, the ERA would use the combined domestic energy network sample and include other listed domestic infrastructure companies.

422. In Economic Insight's review of the estimation of equity beta for Australian energy networks it reviewed other Australian and New Zealand infrastructure companies that could be added to an expanded sample.[213]

423. The ERA examined listed domestic infrastructure companies operating in rail, transportation, ports, airports and telecommunications. The companies evaluated by the ERA are listed in Appendix 3.

424. The ERA is unaware of any Australian regulator that uses this approach.

425. The ERA considers that the expanded domestic sample option has the following advantages:

- It increases the sample of live firms, while retaining a sample that is based in Australia.
- It represents an extension of existing practice, regulatory approach and precedent.

426. The ERA considers that the domestic industry option has the following disadvantages:

- Such an approach moves away from the pure-play energy network benchmark approach. There is likely to be large additional idiosyncratic risks introduced, which may require adjustments.
- The risks of further delistings remains in this domestic industry sample, given investor interest for infrastructure assets.
- When it examined the domestic industry betas, the ERA did not have confidence that they were comparable to an energy network.

427. On balance, for the purposes of equity betas the ERA considers that an expanded domestic sample is not appropriate and would move away from a process that sets efficient rates for energy networks.

International sample – International energy networks

428. Under the international energy networks option, the ERA would use the combined domestic energy network sample and include international comparators that are similar to gas networks service providers.

429. The ERA has initially considered listed firms from jurisdictions that would be most comparable to Australia. Comparability was assessed on the basis of regulatory and market characteristics.

430. With regard to regulatory characteristics the ERA looks to countries where energy networks operate under similar regulatory, legal and other institutional arrangements to ones in Australia.

---

[213] Economic Insights, *Methodological issues in estimating the equity beta for Australian network energy businesses,* June 2021, p. 77.

431. With regard to market factors the ERA looks to countries with capital markets that are sufficiently deep, liquid, large and informationally efficient.

432. On this basis the ERA considers that Commonwealth countries such as the United Kingdom, Canada and New Zealand are close matches to Australia. The ERA considers that the United States is also comparable. The ERA remains open to considering a wider sample of comparators from countries in addition to the above.

433. This approach is consistent with regulatory approaches used by the NZCC (New Zealand Commerce Commission), IPART and Queensland Competition Authority.

434. The ERA has examined listed international firms operating energy networks in the United States, Canada, United Kingdom and New Zealand. The companies evaluated in the international sample are listed in Appendix 4.

435. The ERA notes that other regulators have used international samples for their equity beta estimates. These regulators include the New Zealand Commerce Commission, the Queensland Competition Authority and the Independent Pricing and Regulatory Tribunal of New South Wales.

436. The ERA also uses international samples when estimating the equity betas for Western Australia's three regulated railways. In this context, there existed limited comparable listed Australian companies and the ERA had to consider international companies in order to form benchmark samples.[214]

437. The ERA considers that the international sample option has the following advantages:

- An extended sample size could result in equity beta estimates that are more reliable and less sensitive to individual equity beta estimates of the Australian energy network sample.
- Using international samples could be a more robust approach over time, given the decreasing number of listed Australian energy networks.
- Other regulators have been using international comparators for their equity beta estimation, largely driven by the difficulty in finding a sufficient number of comparable businesses to estimate equity beta using a purely domestic sample.
- IPART uses a broad selection of stocks that includes international firms as it considered that it is likely to be "more objective, more likely to yield statistically reliable estimates, and more resistant to problems caused by companies dropping out of the sample over time".[215]
- The Queensland Competition Authority stated that there is not "a sufficient number of listed Australian firms for us to draw upon in order to determine reasonable betas"[216] and any country-specific effects on beta estimates can "be limited by using a sample of relevant firms from a cross-section of countries where possible." [217]

214 ERA, *Final Determination 2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks and Pilbara Railways*, August 2019, p. 55.

215 IPART, *Review of our WACC method*, February 2018, p. 7.

216 QCA, *Final Report: Rate of Return Review*, November 2021, pp. 71.

217 QCA, *Final Report: Rate of Return Review*, November 2021, pp. 72.

- New Zealand Commerce Commission in evaluating international samples did not consider it necessary to make adjustments for beta estimates for differences in systematic risk due to regulatory differences by country[218]

438. The ERA has previously had reservations about the use of international comparators.[219] The ERA considers that the international sample option has the following disadvantages:

- The use of international comparators presents a departure from existing practice, regulatory approach and precedent.
- The introduction of international comparators may create differences in market structure, regulation and economic factors that affect the estimated beta. If these differences are not quantifiable then they cannot be adjusted to make them comparable to domestic estimates which are the most suitable comparators.

439. On balance, given the smaller Australian domestic sample, as a working view the ERA considers that examining both domestic and international listed energy networks may be useful when estimating the equity beta for Australian energy networks.

440. The ERA has not finalised which international jurisdictions or companies should be considered as part of this approach. The firms detailed in Appendix 4 are an initial working position that the ERA seeks to refine further.

441. The ERA proposes to use the following method:

- To use a domestic CAPM model for each country to estimate the equity beta. The use of an international CAPM would introduce complexity without substantial benefits as it relies on stronger assumptions than the domestic CAPM.[220]
- To only include firms where the majority of the observations are present in the estimation window.
- Consistent with the manner in which domestic equity beta estimates are unlevered and re-levered to the benchmark gearing level, international equity beta estimates will also undergo the same procedure.

442. Given that this is a departure from previous practice the ERA invites comments on:

- Which companies and jurisdictions could be considered part of its sample?
- How should these international estimates be incorporated into the equity beta estimation method such that they are comparable to Australian gas networks service providers?

Question 14

Do you support the continued use of domestic energy networks to estimate equity beta? If not, please explain why and your alternative approach.

218 NZCC, *Input Methodologies (Electricity distribution and gas pipeline services) – Reasons paper*, December 2010, pp. 540-542.

219 ERA, *Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, pp. 44-45, 230.

220 Partington, G. and Satchel, S., *Report to the AER: Alternative Asset Pricing Models*, June 2020, pp.28-34.

Question 15

Do you support the use of a sample of domestic and international comparators to estimate equity beta? If not, please explain why and your alternative approach.

Question 16

If an international sample is to be used for estimating equity beta, which jurisdictions and companies could be considered as part of the sample?

Question 17

If an international sample is to be used for estimating equity beta, how should these international estimates be incorporated into the equity beta estimation method?

10.4.3.2 Market developments

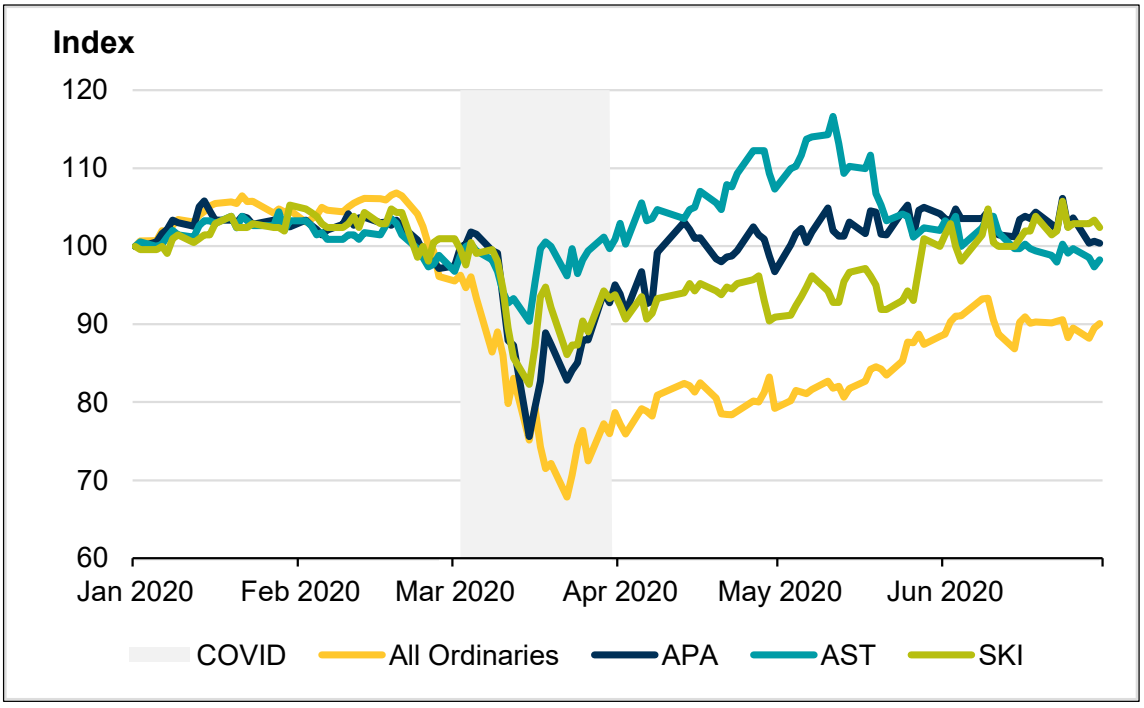
443. Since the 2018 gas instrument Australian markets have been affected by the COVID-19 pandemic and merger announcements, and these market developments have affected the three remaining listed energy networks. As the equity beta measures the correlation of a firm to the broader market, both changes in the returns of a firm and the returns to the market can affect an estimate.

444. The ERA notes that these market events affect the empirical estimates of equity beta in Australia.

Market volatility

445. The ERA observes that during the period of the COVID pandemic there was increased market volatility. Volatility is persistent in historical returns data. The market volatility of the Australian index and domestic energy networks is shown in Figure 6.

Figure 6: Market volatility of Australian index and domestic energy networks



Source: Bloomberg data, ERA analysis
Note: Share prices have been converted into a price index rebased to 100 as at January 2020.

446. The ERA's current thinking on the volatility associated with the COVID-19 pandemic can be summarised as:

- An estimation window is intended to capture returns throughout the economic cycle which also includes downturns. Economic shocks are a natural part of the economic cycle and to remove these observations would be to affect the distribution of returns.
- Shocks can provide local evidence about the true systematic risk of a firm, where the revealed preference of investors is that during a market-wide shock the domestic energy sample were not as affected as the market portfolio.
- It may not be easy to identify COVID-19 related shock events given the multiple waves and interventions that occurred during 2020.

- The ERA's current approach of using robust estimators would moderate the impact of outliers, where COVID-19 could be considered to be such an outlier.

447. The ERA's working view is that the COVID-19 shock does not require an adjustment of method but is seeking comment on the matter.

Acquisitions

448. All firms in the Australian energy network sample have been the subject of takeover offers, or have been part of takeover bids.

449. Besides reducing the number of live firms through delisting a company, an acquisition transaction may affect the informativeness of returns around the announcement window and towards close.

- A firm's price that is subject to a takeover will be affected by the timing of acquisition news. This effect on the firm's price will affect its covariance with the market return. Acquisitions are generally subject to large premiums on the current market price.
- Similarly, a firm's price post acquisition announcement may also be abnormal.
- It is likely price changes post announcement reflect changing expectations of takeover success.
- An announced target price could create a floor and ceiling that reduces the price informativeness of future trading given the convergence of the share price to the offer price conditioning on success.

450. Merger and acquisition announcements are firm-specific events that can be considered idiosyncratic, though industry merger waves could be suggestive of a broader systematic issue.

451. The ERA relies on market data for equity beta estimation. In the event that certain observations are outliers or would otherwise be not representative then it may be possible for statistical techniques to be employed to make adjustments:

- Winsorisation and trimming could be used to address outliers.[221]
- A greater reliance on robust regression techniques could also be used to moderate outlier effects on Ordinary Least Squares estimates.[222]

[221] Winsorisation and trimming are approaches that address outliers in two separate ways. Winsorisation sets the values beyond a determined threshold point of the distribution (for example, observations less than the 5th percentile and greater than the 95th percentile) equal to that threshold point. By contrast, trimming removes outliers completely from the data set.

[222] Robust regression techniques are ones that are not as reliant on the traditional assumptions underlying ordinary least squares regression. This is useful in the presence of observations that either are vertical outliers or bad leverage points. Rousseeuw, P. and Leroy, A., *Robust Regression and Outlier Detection*, 2003, Wiley.

452. The ERA's current thinking on the effect of takeover offers can be summarised as:

- The ERA acknowledges that the returns on announcement dates likely reflect idiosyncratic news rather than systematic risk. Removing the announcement day return from the sample as a data cleaning step could be justified on this basis.
- The ERA is unclear how returns pre and post takeover announcement should be treated, where idiosyncratic takeover information may prevent systematic or fundamental information being incorporated into prices.
- However, the ERA notes that its current estimation approach of using robust estimators would moderate the impact of outliers, where takeover announcements could be considered to be such an outlier.

453. The ERA's working view is that takeover offers are not a material problem, or could be handled via some adjustment process. The ERA invites comment on this matter.

454. The ERA invites comment on these market developments, specifically regarding:

- Whether market developments are so material that they justify adjustments that are not provided for using robust regression methods?
- Whether takeover announcements necessitate adjustments during the following event windows:
  - In the period shortly before the announcement.
  - At the time of the announcement.
  - In the period after the announcement and before the stock is delisted.

Question 18

When considering equity beta should the ERA consider shocks such as COVID-19 and takeover announcements? If so, please explain why and how these events can be accounted for.

10.4.3.3 Estimation method

455. The ERA's working view for the 2022 gas instrument is to maintain a similar equity beta estimation method to the 2018 gas instrument.

456. The ERA's preliminary considerations on the equity beta estimation method are detailed below.

Sample period

457. To estimate equity beta the ERA must select an estimation window. That is, the time horizon over which the returns of firms and the market is observed.

458. The length of the estimation window involves a trade-off between relevance of the data and statistical robustness:

- Longer periods can include behaviour in the data that is no longer relevant due to changing economic and market conditions.
- Shorter periods may produce estimates that are less statistically robust.

459. For the 2018 gas instrument, the ERA considered that a five-year period with weekly data balanced these trade-offs while being consistent with the regulatory reset period.

460. As return on equity is a forward-looking concept, equity beta should ideally reflect expectations informed by prevailing market conditions. This suggests that a shorter estimation window should be used, as longer estimation windows introduce risks that structural breaks are present in the return series, which make estimated equity betas less useful.

461. The ERA notes that the current five-year window includes market shocks such as COVID-19. To the extent that this shock biases equity beta estimation, a longer window could moderate the impact of COVID-19.

462. The ERA's working view for the 2022 gas instrument is to retain the use of a five-year estimation window with weekly data.[223] The balance between relevance and statistical robustness still lies in favour of five-year estimation windows:

- The ERA notes the findings from the Brattle Group's report that international regulators tend to favour shorter estimation windows.
- Concerns of market shocks are possibly moderated by the ERA's use of robust estimators.

Estimation techniques

463. The ERA largely adopts the estimation method and techniques as described in the 2018 gas explanatory statement.[224]

464. The ERA is considering a simplification of its existing approach in the interests of making it easier for all stakeholders to understand and replicate its approach.

465. The ERA's 2018 gas instrument calculated equity returns using Bloomberg price and dividend data for the market portfolio and the benchmark energy network sample.

466. For the 2022 gas instrument the ERA is proposing to simplify its approach by using the total return index as calculated by Bloomberg for individual stocks and market index.

- Bloomberg provides total equity return data that combines price and dividend data into a single series.
- Bloomberg's total equity return data is commonly used and is a high-quality data set.
- This approach creates consistency and replicability for stakeholders as it conducts analysis on standardised data.

[223] Weekly returns strike the appropriate balance as daily estimates are too noisy, and monthly is too short given the five-year window.

[224] ERA, *Final Gas Rate of Return Guidelines Explanatory Statement,* December 2018, p. 216-224.

467. The ERA's 2018 gas instrument approach to estimating equity betas used four differing techniques including:

- Ordinary Least Squares (OLS)
- Least Absolute Deviation (LAD)
- maximum likelihood robust method (MM)
- Theil-Sen (T-S).

468. The ERA's 2018 gas instrument used traditional OLS estimates in conjunction with robust estimators (LAD, MM, and T-S). Robust estimators are designed to deal with outliers which could affect OLS estimation. The ERA considered these techniques have differing characteristics and their combined consideration contributes to a robust equity beta estimation.

469. The ERA's working view for the 2022 gas instrument is that OLS and the LAD estimators are the empirical methods to be used for estimating equity beta:

- Robust estimators assist in situations where outliers may have a significant influence on the equity beta.
- The LAD estimator achieves this function to a large degree. The ERA has generally observed that the results from MM and T-S are highly correlated to the LAD.
- The ERA notes that other regulators usually estimate equity beta using only the OLS estimator.
- The ERA considers that it is appropriate to use a robust estimator in addition to the OLS estimator. The ERA proposes to solely rely on the LAD, which can be more easily verified by external parties using generally available statistical packages (than MM and T-S).

Question 19

Do you support the ERA's general approach and methodological simplications for estimating equity beta (regardless of any potential changes to the sample firms)? If not, please explain why and your alternative approach. Specifically, the ERA is interested in views on the following aspects of the method applied to estimate equity beta in this paper:

- Use of a 5-year estimation window with weekly returns.
- Use of the Bloomberg total return index for individual stocks and market indices.
- Use of the Ordinary Least Squares estimator, with the Least Absolute Deviations method as a robust estimator.

Low beta bias and the Black method

470. The ERA has given further consideration to low beta bias and the Black method. These are two different concepts, which need to be distinguished:

- The low beta bias is an observation that *ex post* returns from low beta stocks tend to outperform expected returns.

- The Black method is an alternative asset pricing model to the Sharpe-Lintner CAPM. The main theoretical difference between the Black method and the Sharpe-Lintner CAPM relates to borrowing and lending assumptions.[225] As a result of different starting assumptions, the Black method predicts a slope of estimated returns that can be flatter than for the Sharpe-Lintner CAPM.

471. The ERA considered low beta bias for the 2018 gas instrument and concluded that:[226]

- Advice from Partington and Satchell was not supportive of the low beta bias being applied in economic regulation.
- Low beta bias is more of an *ex post* observation than an *ex ante* expectation.
- *Ex ante* empirical results from implied cost of capital models were not reliable as they were subject to theoretical and empirical concerns.

472. Partington and Satchell found that no regard should be given to the low beta bias and the Black method when estimating the forward-looking required return on equity.[227]

473. In its review of asset pricing models, the AER preferred the Sharpe-Lintner CAPM, not the Black method.[228] In their advice to the AER, Partington and Satchell maintain that the Black method had serious implementation problems that made it unsuitable for calculating regulatory beta.[229]

474. Additionally, the AER's proposed approach for the 2022 Instrument is to give no role to the Black method and to not recognise low beta bias.[230]

475. The ERA is unaware of any new information that would justify a departure from the previous position from the 2018 gas instrument.

476. The ERA's working view is that no consideration or adjustments will be made for low beta bias or the Black method in the 2022 gas instrument.

Preliminary equity beta estimates

477. On the basis of the above, the ERA's preliminary equity beta estimation has been conducted on the existing domestic energy network sample and the international comparators detailed in Appendix 4.

478. To illustrate the results under the ERA's proposed method, the ERA has chosen a five-year sample period (July 2016 to June 2021).

479. As the ERA is considering international comparators, the ERA has examined equity beta on a country-by-country basis.

---

225 The Sharpe Lintner CAPM assumes that investors can access unlimited borrowing and lending at the risk free rate. The Black method relaxes this assumption, and instead assumes that investors can access unlimited short selling of stocks, with the proceeds immediately available for investment.

226 ERA, *2018 Final Gas Rate of Return Guidelines Explanatory Statement*, December 2018, pp. 232-236.

227 Partington G. and Satchell, S., *Report to the AER: Discussion of submissions on the Draft 2018 Guideline*, November 2018, p. 15.

228 AER, *Rate of return – CAPM and alternative return on equity models, Final working paper*, December 2020, p. 6.

229 Partington, G. and Satchell, S., *Report to the AER: Alternative Asset Pricing Models*, June 2020, pp. 34-37.

230 AER, *Equity Omnibus, Draft working paper*, July 2021, p. 15.

480. To arrive at an estimate of equity beta, the ERA will utilise its discretion and places more weight on the domestic energy sample, informed by the estimates from other countries.

481. The Australian domestic energy sample estimates are detailed in Table 6.

Table 6: Australian equity beta estimates at benchmark leverage

	Assets					Portfolios			
Estimator	APA	AST	DUE	SKI	**Average of Assets**	Equal Weighted	Value Weighted	Average of Portfolios	**Average of Assets and Portfolios**
OLS	0.759	0.286	0.466	0.383	**0.474**	0.473	0.425	**0.449**	**0.461**
LAD	0.896	0.532	0.430	0.505	**0.591**	0.735	0.542	**0.639**	**0.615**
Mean All Methods	**0.828**	**0.409**	**0.448**	**0.444**	**0.532**	**0.604**	**0.484**	**0.544**	**0.538**

Source: ERA analysis.

482. The Australian energy network sample produces a range of individual firm beta estimates from 0.4 to 0.8. The average beta estimate from the Australian energy network sample is 0.5.

483. A summary of the domestic and international energy sample estimates is detailed in Table 7. Detailed beta estimates are provided in Appendix 5.

Table 7: Domestic and International equity beta estimates a benchmark leverage

Estimator	AUS	US	Canada	UK	NZ	Mean of all countries
Gearing	0.521	0.404	0.505	0.430	**0.414**	**0.455**
Panel A: Equity beta at target leverage						
OLS	0.461	1.133	0.900	0.919	0.648	**0.812**
LAD	0.615	0.813	0.782	0.763	0.565	**0.707**
Mean All Methods	0.538	0.973	0.841	0.841	0.606	**0.760**
Panel B: Asset beta						
OLS	0.208	0.510	0.405	0.414	0.291	**0.366**
LAD	0.277	0.366	0.352	0.343	0.254	**0.318**
Mean All Methods	**0.242**	**0.438**	**0.378**	**0.379**	**0.273**	**0.342**

Source: ERA analysis.

484. The ERA considers that the domestic energy sample provides a range of equity beta estimates from 0.5 to 0.6. When international comparators are examined, this provides a range of estimates from 0.6 to 1.1. The average beta estimate across all countries is 0.76.

485. The ERA notes that most equity betas appear to be greater in magnitude in other jurisdictions than in Australia. As previously discussed in the 2018 gas explanatory statement, it seems likely that differences in regulatory, market and operational activities are responsible for some of these differences.

486. However, the ERA is also aware that the samples in which these international estimates are largely derived from large, liquid capital markets.

487. To select a point estimate for equity beta, the ERA considers all available information and uses its discretion to select a point estimate. Given the imprecision in the estimation process the ERA proposes to continue its practice of rounding to the nearest first decimal place.

488. The ERA's working view for the 2022 gas instrument is to use an equity beta of 0.7. This number has been selected as being below the international estimates to recognise the lower Australian equity beta estimates. The equity beta will remain fixed for the life of the gas instrument.

489. The ERA is continuing to refine its estimation method to produce the best estimate for an Australian energy network.

11. Inflation

490. Inflation is the rate of change in the general level of prices of goods and services.

491. To invest, debt and equity investors will require compensation for inflation.

492. A nominal rate of return incorporates the real rate of return, compounded with a rate that reflects expectations of inflation.

493. The treatment of inflation and the setting of the rate of return are foundational in setting regulated revenues. The NGR require the ERA to determine a method that is likely to result in the best estimates of expected inflation:

> 75B(2)(b) the method that the [ERA] determines is likely to result in the best estimates of expected inflation

494. 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.
- To back out the expected inflation underpinning the nominal building block allowances in the tariff variation mechanism, to allow accounting for subsequent actual inflation.

495. Gas network service providers receive:

- An *ex-ante* real return on assets set at the time of regulatory determination. To determine a real return the expected forward-looking inflation underpinning nominal returns is removed.
- Compensation for movement in inflation because the regulatory asset base is indexed to actual inflation. Actual inflation is used to ensure that regulatory assets remain fixed in real terms.

496. The forecast of the expected rate of inflation will also allow stakeholders to observe the real rates of change in tariffs and in the real rate of return, which is itself an important contributor to the real changes in tariffs.

497. This chapter outlines the ERA's working view on the approach to determining the expected rate of inflation that should apply in the 2022 gas instrument.

11.1 2018 position

498. Under the 2018 gas instrument, the ERA estimated the expected inflation rate using the Treasury bond implied approach over a term that matched the regulatory period.

499. The term of the resulting average expected inflation rate was five years, consistent with the length of the access arrangement period.

500. The Treasury bond implied inflation approach uses the Fisher equation and the observed yields of:[231]

- Five-year Commonwealth Government Securities, which reflect a market-based estimate of the nominal risk free rate.
- Five-year Treasury indexed bonds, which reflect a market-based estimate of a real risk free rate.

501. 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.

502. The expected inflation rate is estimated consistent with the estimate of the risk free rate by adopting an averaging period of 20 trading days. The averaging period is nominated in advance by service providers and should be close to, and prior to, an access arrangement decision.

503. The approach uses linear interpolation to derive the daily point estimates of both the nominal five-year risk free rate and the real five-year risk free rate, for use in the Fisher equation.[232]

11.2 Developments since 2018 instrument

504. Inflation outcomes have been below the mid-point of the RBA's target band for an extended period.

- Between when the 2018 gas instrument came into effect and June 2021, Australia's annual inflation growth has remained persistently below historical average levels and below the mid-point of the RBA's inflation target band of 2.5 per cent.
- Before this, annual inflation last exceeded 2.5 per cent in June 2014 and so Australia has until, recently experienced, an unusually long period of persistently low inflation.[233]

505. Near-term inflation has been volatile and uncertain due to the effects of economic recovery from the COVID-19 pandemic, uncertainty around central bank monetary policy and global supply chain concerns. Expected inflation expectations in the market have recently increased, but it is uncertain whether this will be transitory or more permanent. This raises the possibility of volatile inflation during the period in which the 2022 gas instrument is in effect.

---

231 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.

232 It is not common to observe a Commonwealth Government Security 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 regulatory period end date by assuming a linear increase in yields between the straddle dates on the two bonds observed.

233 ABS, *Catalogue number 6401.0*, September 2021.

506. In 2020, the AER undertook a review of the regulatory treatment of inflation. The review sought to improve the performance of forecasts of expected inflation in periods of economic instability or sustained periods of low or high inflation. The AER released its final position paper in December 2020.[234]

507. In its final position paper, the AER:

- Shortened the target inflation horizon from 10 years to a term that matches the regulatory period. The AER considered that this better aligned the estimate of expected inflation and the roll forward of the regulated asset base, which is done over a five-year term.[235]
- Continued the use of the RBA inflation forecast and target band method.[236]
- Adjusted its estimation method to apply a linear glide-path from the RBA's forecasts of inflation for years one and two to the mid-point of the inflation target band (2.5 per cent) in year five. The AER considered that the application of a glide-path acknowledges that it was likely to take longer than previously for inflation to revert to the mid-point of the RBA's target band following periods of sustained low or high inflation.[237]

11.3 2022 initial position

508. The ERA's working view for the 2022 gas instrument is that the term of expected inflation should continue to be five years, consistent with the length of the access arrangement period. This is the best estimate of what inflation is expected to be over the access arrangement period.

509. Dr Lally's recent advice to the AER confirmed that the best estimate of expected inflation should match the regulatory period:[238]

> Firstly, given that the AER's regulatory cycle is five years, the NPV = 0 principle implies that the AER ought to be estimating expected inflation over each of the next five years rather than over the next ten years.

510. The ERA has given further consideration to methods for best estimating expected inflation for the 2022 gas instrument, including use of:

- the Treasury bond implied inflation approach (the ERA's current approach)
- the RBA inflation forecast approach.

511. The Treasury bond implied inflation approach has the following advantages:

- The rationale for using a market-based approach is that market prices reflect the aggregation of diverse market participant expectations that invest and commit money. The forecasts of many different market participants are considered to contain more information and be more relevant than any one particular forecast model or method.

234 AER, *Final position: Regulatory treatment of inflation,* December 2020.

235 AER, *Final position: Regulatory treatment of inflation,* December 2020, p. 6.

236 AER, *Final position: Regulatory treatment of inflation,* December 2020, p. 6.

237 AER, *Final position: Regulatory treatment of inflation,* December 2020, pp. 6-7.

238 Dr Lally, M., *Review of the AER's inflation forecasting methodology,* July 2020, p. 31.

- The method is consistent with market forecasts built into other WACC parameters.
- The method is a dynamic market measure that is updated daily.
- The method is relatively easily to calculate.

512. The Treasury bond implied inflation approach has the following disadvantages:

- This method assumes efficient pricing of Treasury bonds, in that observed yields must reflect the value that the market places on these instruments at a given moment in time. A decrease of liquidity for Treasury indexed bonds may lead to a lack of frequent trading and observed yields not reflecting efficient pricing.
- There is an inherent bias, due to investors demanding an inflation premium to compensate for being exposed to uncertainty around the future inflation rate. The size of these premia may vary over time. However, the size of biases may be small and using a five-year period may likely further reduce the size of these potential effects.

513. An alternative method to estimate inflation is the RBA approach that uses the RBA inflation forecast and target band method. This approach estimates the expected inflation rate using:

- The mid-point of the RBA's headline inflation rate forecast range for years one and two from the most recent RBA statement on monetary policy.
- The mid-point of the RBA's target inflation band of 2 per cent to 3 per cent for the remaining years of the period, or some path to achieve the 2.5 per cent mid-point by some future point in time.

514. The RBA inflation forecast approach has the following advantages:

- It is adopted by other Australian regulators.
- The method is relatively easy to calculate.
- The method incorporates the RBA's short-term inflation forecasts for years one and two.

515. The RBA inflation forecast approach has the following disadvantages:

- The RBA's statement of monetary policy is updated infrequently throughout the year and therefore at any point in time may not reflect changing inflation expectations.
- Given a weight is placed on the mid-point of the RBA's target, the inflation forecast may be somewhat static and may not reflect changing inflation expectations.
- Inflation has gone for periods of being below the mid-point of the inflation range.
- As the RBA only publishes short-term forecasts of inflation, this method requires assumptions to be made to develop a forecast of inflation for the remaining years of the forecast period including:
    - The return of inflation to the mid-point of the inflation range (2.5 per cent) over a forecast period or at some other future point in time.
    - The speed of the glide-path to reaching the mid-point.

- In an environment of low or high inflation and a shorter inflation forecast term, this may assume that inflation quickly moving over the forecast period to reach the mid-point. This assumption may not accurately reflect investor expectations of inflation.
- The approach may also not accommodate situations where the RBA's short-term inflation estimates for year one and year two are in the lower bounds of the target range or close to the mid-point, but inflation is expected by investors to accelerate above the mid-point over the remaining years (or vice versa). The ERA notes that the RBA will not increase the cash rate until actual inflation is sustainably within the target range.[239] This may well mean that inflation moves above the mid-point of the range.
- The approach may not be consistent with the market inflation expectations built into the market yields for the risk free rate.

516. The challenge in determining a method that is likely to result in the best estimate of inflation expectations is that these forward-looking expectations are not directly observable. Furthermore, no method to estimate expected inflation is perfect and it is up to regulators to use their discretion to decide, on balance, which method may provide the best estimate of expected inflation for the regulatory period.

517. The ERA's working view for the 2022 gas instrument is that expected inflation should continue to be estimated using the Treasury bond implied inflation approach.

518. Having regard to the available evidence, the ERA considers that the Treasury bond implied inflation approach is the best measure of inflation expectations for a regulatory period. This method is consistent with and most appropriately aligns with the ERA's regulatory period.

519. The ERA continues to support the Treasury bond implied inflation approach over the RBA approach as:

- It uses both nominal and real risk free rates directly observed in the market, which includes information on the market's view of the expected inflation rate. The rationale for using market-based approaches is that market prices reflect the aggregation of diverse market expectations.
- It is a dynamic market measure that is updated daily.
- It is not driven by static policy targets.
- It is consistent and aligns with market forecasts built into other WACC parameters.

520. The ERA proposes to continue to apply the Treasury bond implied inflation approach as follows:

- Using the yields on five-year Treasury bonds.
- Estimating the expected inflation rate consistent with the estimate of the risk free rate. The averaging period will be nominated in advance by service providers and should be close to, and prior to, an access arrangement decision.
- Using linear interpolation to derive the daily point estimates of both the nominal five-year risk free rate and the real five-year risk free rate, for use in the Fisher equation.

[239] RBA, *Statement by Philip Lowe, Governor: Monetary Policy Decision*, 2 November 2021, available online.

521. The ERA considers that this approach will achieve the best estimate of inflation for the regulatory period and is in the long-term interests of consumers, because it would likely promote efficient investment in, and use of, gas networks services.

Question 20

When estimating expected rate of inflation do you support the use of Treasury bond implied inflation approach? If not, please explain why and your alternative approach.

12. Value of imputation credits (gamma)

522. The imputation tax system prevents corporate profits from being taxed twice. Under the Australian imputation tax system, franking credits are distributed to investors at the time that dividends are paid and provide an offset to those investors' taxation liabilities.

523. The gamma parameter accounts for the reduction in the effective corporate taxation that is generated by the distribution of franking credits to investors. Generally, investors who can use franking credits will accept a lower required rate of return, before personal tax, on an investment that has franking credits, compared with an investment that has similar risk and no franking credits.

524. The ERA factors the value of imputation credits into its regulatory determination allowances via adjustments to the taxation building block and market risk premium.

525. This chapter outlines the ERA's working view on the approach to determining gamma that should apply in the 2022 gas instrument.

12.1 2018 position

526. The 2018 gas instrument applied a gamma of 0.5, which was fixed over the period of the instrument.[240]

527. The ERA applied the utilisation approach to estimating the post company value of imputation credits. The ERA interpreted the value of imputation credits as an estimate of the proportion of company tax, which is expected to be returned to investors through utilisation credits.

528. The ERA estimated a gamma of 0.5 using the Monkhouse formula as the product of the distribution rate and the utilisation rate:

Gamma = distribution rate x utilisation rate

529. The distribution rate represents the proportion of imputation credits created that is expected to be distributed to investors. The ERA considered that the distribution rate was a firm-specific, rather than a market-wide, parameter.[241]

530. The ERA applied an estimate of 0.9 for the distribution rate. This was determined based on the financial reports of the 50 largest ASX-listed firms.[242]

531. The utilisation rate is the weighted average of the utilisation rates of individual investors, with investors able to fully use the credits having a rate of one and those unable to use them having a rate of zero. The ERA considered that the utilisation rate was a market-wide rather than a firm-specific parameter.

240 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 40.

241 ERA, *Final Rate of Return Guidelines (2018),* December 2018, p. 39.

242 Dr Lally, M., *Estimating the Distribution Rate for Imputation Credits for the Top 50 ASX Companies*, October 2018, p. 4.

532. The ERA applied an estimate of 0.6 for the utilisation rate. The ERA derived this estimate by applying the equity ownership approach to determine the percentage of domestic investors in the Australian equity market. The utilisation rate was estimated for all Australian equity from the national accounts of the Australian Bureau of Statistics (ABS).[243]

12.2 Developments since 2018 instrument

533. Since the 2018 gas instrument the ERA has estimated a utilisation rate of 0.6. This estimated utilisation rate is from the national accounts of the ABS, based on a five-year average to March 2021 and rounded to the first decimal point.[244]

534. The AER's 2020 annual rate of return update used data from the ABS to produce a range for the utilisation rate of 0.61 to 0.70.[245]

535. In March 2021, the AER requested further assistance from the Australian Taxation Office (ATO) on the analysis provided in 2018 to estimate gamma and is currently waiting for more information from the ATO.[246] The AER has sought further detail on two confidential estimates:

- Net franking credit usage.
- Imputation credits distributed to residents versus non-residents as a percentage of imputation credits distributed.

12.3 2022 initial position

536. The ERA's working view for the 2022 gas instrument is that gamma should continue to be estimated using the utilisation approach and that a gamma of 0.5 should be maintained. Gamma will remain fixed for the life of the gas instrument.

537. The ERA's preliminary estimate of gamma is derived by applying the Monkhouse formula. The input parameters (distribution rate and utilisation rate) are separately estimated as follows:

- The ERA's estimate of the distribution rate is 0.9, which is based on the distribution rate from the financial reports of the 50 largest ASX-listed firms.[247] Further, the ERA considers that Dr Lally's finding that the distribution rate may be slightly higher with the removal of foreign operations supports that the distribution rate should be at least 0.9.[248] [249]

[243] ERA, *Final Gas Rate of Return Guidelines,* December 2018, p. 40.

[244] ABS, *Australian National Accounts: Finance and Wealth, Catalogue 5232.0, Tables 48 and 49*.

[245] AER, *Rate of Return Annual Update,* December 2020, p. 26.

[246] AER, *Rate of return Overall rate of return: Draft working paper*, July 2021, p. 43.

[247] Dr Lally, M., *Estimating the Distribution Rate for Imputation Credits for the Top 50 ASX Companies*, October 2018.

[248] Dr Lally, M., *The Estimation of Gamma: Review of Recent Evidence,* December 2018.

[249] Dr Lally, M., *Estimating the Distribution Rate for Imputation Credits for the Top 50 ASX Companies,* October 2019.

- The ERA's estimate of the utilisation rate is 0.6. This estimate was derived using the equity ownership approach to determine the percentage of domestic investors in the Australian equity market. The utilisation rate is estimated for all Australian equity from the national accounts of the ABS and rounded to the first decimal point.

538. The ERA has used a gamma of 0.5 for its most recent rate of return determinations.[250, 251, 252, 253, 254]

539. Over the course of its reviews of electricity, gas and rail rates of return, the ERA has considered gamma. The ERA's current approach to gamma is based on:

- Contemporary Australian Competition Tribunal and Federal Court judicial reviews, which supported the use of the utilisation approach.
- The limitations of ATO data being applied to the calculation of gamma.
- Expert reports and analysis, which presented new methods and numbers to inform improved calculations of gamma.

540. The ERA's working view is that this approach will achieve the best estimate of gamma for the regulatory period and is in the long-term interest of consumers, because it will likely promote efficient investment in, and use of, gas networks services.

541. The ERA will continue to review any further developments that clarify the use of ATO tax statistics.

250 ERA, *Final decision on proposed revisions to the Dampier to Bunbury Natural Gas Pipeline access arrangement 2021 to 2025,* April 2021*,* p. 312.

251 ERA, *Final decision on proposed revisions to the Goldfields Gas Pipeline Access Arrangement for 2020 to 2024*, December 2019, November 2019, p. 154.

252 ERA, *Final decision on proposed revisions to the Mid-West and South-West Gas Distribution Systems access arrangement for 2020 to 2024*, p. 296.

253 ERA, *Final Decisions on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, September 2018, p. 104.

254 ERA, *Final Determination 2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks and Pilbara Railways*, August 2019, Chapter 9.

Appendix 1 List of Tables

Appendix 2 List of Figures

Appendix 3 Domestic Industry Sample

Ticker	Name	Description
Toll roads and rail		
ALX AU Equity	ATLAS ARTERIA	Atlas Arteria Limited operates as an infrastructure developer and operator. The Company constructs highways, roads, bridges, and tunnels. Atlas Arteria also collects toll. Atlas Arteria serves clients worldwide.
TCL AU Equity	TRANSURBAN GROUP	Transurban Group is an Australia-based toll-road operator. The Company builds and operates urban toll networks in Australia, Canada, and the United States.
AZJ AU Equity	AURIZON HOLDINGS LTD	Aurizon Holdings Ltd is a rail freight company. The Company provides coal, bulk and general freight haulage services, operating on the central Queensland coal network (CQCN) and including specialized track maintenance and workshop support functions.
Ports and Airports		
QUB AU Equity	QUBE HOLDINGS LTD	Qube Holdings Ltd. is a logistics company. The Group operates in divisions covering Automotive, Bulk and General Stevedoring, Landside Logistics and Strategic Development Assets.
SYD AU Equity	SYDNEY AIRPORT	Sydney Airport operates the Sydney, Australia airport. The Company develops and maintains the airport infrastructure and leases terminal space to airlines and retailers.
AIA AU Equity	AUCKLAND INTL AIRPORT LTD	Auckland International Airport Limited owns and operates the Auckland International Airport. The Airport includes a single runway, an international terminal and two domestic terminals. The Airport also has commercial facilities which includes airfreight operations, car rental services, commercial banking centre and office buildings.

Telecommunications		
TLS AU Equity	TELSTRA CORP LTD	Telstra Corporation Limited is a full service domestic and international telecommunications provider for Australia. The Company provides telephone exchange lines to homes and businesses, supplying local, long distance and international telephone calls and supplying mobile telecommunications services. Telstra also provides data, internet, on-line services and directory services.
TPG AU Equity	TPG TELECOM LTD	TPG Telecom Ltd provides telecommunication services. The Company offers mobile and fixed broadband solutions. Vodafone Hutchison Australia serves customers in Australia.
SPK AU Equity	SPARK NEW ZEALAND LTD	Spark New Zealand Limited (formerly Telecom Corporation of New Zealand Limited) is a digital services provider for communications, entertainment and IT services over its networks and the Cloud to New Zealanders and businesses. The Company's strategy is focused on customer experiences, mobility and data.
VOC AU Equity	VOCUS GROUP LTD	Vocus Group Limited owns and operates independent voice and data networks. The Company offers a range of products encompassing both voice and data to clients in the United States, China, Hong Kong, Singapore, Australia, and New Zealand.
CNU AU Equity	CHORUS LTD	Chorus Ltd is a fixed line communications infrastructure business. As a wholesale only network operator, the Company enables retail service providers to deliver fixed line and mobile network services to their customers. The Chorus fibre and VDSL network makes high-speed broadband available to the majority of broadband capable lines throughout New Zealand.
MAQ AU Equity	MACQUARIE TELECOM GROUP LTD	Macquarie Telecom Group Limited is an Australian telecommunications service provider. The Group provides local and long distance, calling card and inbound calling services along with the management of telecommunications facilities. The Group also provides data services such as ATM, ISDN and digital leased line along with telecommunications advisory services.

Appendix 4 International Comparator Sample

Ticker	Company Name	ERA Industry	Company Description
Canada			
ACO/X CN Equity	ATCO LTD -CLASS I	Integrated	ATCO Ltd. generates, transmits, and distributes electric power to customers in Canada, and owns and operates power projects in Canada, Great Britain, and Australia. The Company also gathers, stores, transmits, and distributes natural gas in Alberta, Canada. In addition, ATCO manufactures and sells industrial workforce housing, provides technical services, and conducts other operations.
ALA CN Equity	ALTAGAS LTD	Gas	AltaGas Ltd. produces, transmits, distributes, processes and stores natural gas, and generates electricity. The Company also offers energy management consulting services and arranges gas and electricity supply for non-residential end users.
AQN CN Equity	ALGONQUIN POWER & UTILITIES	Integrated	Algonquin Power & Utilities Corp. owns and has interests in a diverse portfolio of renewable power generation and sustainable infrastructure assets across North America. The Company's interests include renewable energy facilities, thermal energy facilities, and water distribution and waste-water facilities.
CU CN Equity	CANADIAN UTILITIES LTD-A	Integrated	Canadian Utilities Limited conducts operations in electrical utility services, independent power production, and retail gas and electricity marketing. The Company also distributes, transmits, gathers, processes, and stores natural gas. In addition, Canadian Utilities provides technical logistical services and billing and call centre services.

Ticker	Company Name	ERA Industry	Company Description
EMA CN Equity	EMERA INC	Integrated	Emera Inc. owns and operates a broad portfolio of electric and natural gas generation, transmission and distribution assets and services, and has an overall strategic focus on transformation to cleaner energy. The Company serves customers across Canada, the Caribbean and the United States, including Florida and New Mexico.
FTS CN Equity	FORTIS INC	Integrated	Fortis, Inc. operates as a gas and electric distribution company. The Company offers regulated utilities comprised of electric and gas as well as engages in non-regulated hydroelectric operations. Fortis serves customers across Canada and in the United States and the Caribbean.
H CN Equity	HYDRO ONE LTD	Electricity	Hydro One Limited is an electrical transmission and distribution utility in Ontario. The company delivers electricity safely and reliably to customers across the province, and to large industrial customers and municipal utilities. Hydro One owns and operates Ontario's transmission and low-voltage distribution network.
SPB CN Equity	SUPERIOR PLUS CORP	Gas	Superior Plus Corporation distributes propane, supplies chemicals and technology, and produces potassium products. The Company is the sixth largest retail propane distributor in the US. Superior Plus serves clients in the United States and Canada.
United Kingdom			
NG/ LN Equity	NATIONAL GRID PLC	Integrated	National Grid plc is an investor-owned utility company which is focused on the transmission and distribution of electricity and gas. The Company owns and operates the electricity transmission network in England and Wales, the gas transmission network in Great Britain, and electricity transmission networks in the North Eastern United States and Scotland.

Ticker	Company Name	ERA Industry	Company Description
SSE LN Equity	SSE PLC	Integrated	SSE plc generates, transmits, distributes, and supplies electricity to industrial, commercial, and domestic customers in the United Kingdom and Ireland. The Company also stores and distributes natural gas, and operates a telecommunications network that offers bandwidth and capacity to companies, public sector organizations, Internet service providers, and others.
New Zealand			
VCT NZ Equity	VECTOR LTD	Integrated	Vector Limited is an energy infrastructure company in New Zealand that provides electricity and gas transmission and distribution along with metering. The Company is also a wholesaler of LPG and natural gas. Vector also delivers broadband voice and data communications in the Auckland and Wellington regions.
United States			
AEE US Equity	AMEREN CORPORATION	Integrated	Ameren Corporation is a public utility holding company. The Company, through its subsidiaries, generates electricity, delivers electricity, and distributes natural gas to customers in Missouri and Illinois.
AEP US Equity	AMERICAN ELECTRIC POWER	Electricity	American Electric Power Company, Inc. (AEP) operates as a public utility holding company. The Company generates, transmits, distributes, and sells electricity to residential and commercial customers. AEP serves customers in the United States.
AES US Equity	AES CORP	Electricity	The AES Corporation acquires, develops, owns, and operates generation plants and distribution businesses in several countries. The Company sells electricity under long term contracts and serves customers under its regulated utility businesses. AES also mines coal, turns seawater into drinking water, and develops alternative sources of energy.

Ticker	Company Name	ERA Industry	Company Description
AGR US Equity	AVANGRID INC	Integrated	Avangrid, Inc. is a U.S. based diversified energy and utility company that provides clean energy. The Company owns and operates electricity generation and natural gas storage utilities.
ALE US Equity	ALLETE INC	Electricity	ALLETE, Inc. provides energy services in the upper Midwest United States. The Company generates, transmits, distributes, markets, and trades electrical power for retail and wholesale customers.
ATO US Equity	ATMOS ENERGY CORP	Gas	Atmos Energy Corporation distributes natural gas to utility customers. The Company's non-utility operations span various states and provide natural gas marketing and procurement services to large customers. Atmos Energy also manages company-owned natural gas storage and pipeline assets, including an intrastate natural gas pipeline in Texas.
AVA US Equity	AVISTA CORP	Integrated	Avista Corporation operates as an energy company. The Company generates, transmits, and distributes electric and natural gas. Avista serves business and residential customers in the United States.
BKH US Equity	BLACK HILLS CORP	Integrated	Black Hills Corporation is a growth-oriented utility company. The Company delivers electricity and natural gas, generates electricity and produces coal to serve onsite generation. Black Hills serves customers in Arkansas, Colorado, Iowa, Kansas, Montana, Nebraska, South Dakota, and Wyoming.
CMS US Equity	CMS ENERGY CORP	Integrated	CMS Energy Corporation is an energy company. The Company, through its subsidiaries, provides electricity and natural gas to its customers. CMS Energy also invests in and operates non-utility power generation plants in the United States and abroad.
CNP US Equity	CENTERPOINT ENERGY INC	Integrated	CenterPoint Energy, Inc. is a public utility holding company. The Company, through its subsidiaries, conducts activities in electricity transmission and distribution, natural gas distribution, interstate pipeline and gathering operations, and power generation.

Ticker	Company Name	ERA Industry	Company Description
CPK US Equity	CHESAPEAKE UTILITIES CORP	Gas	Chesapeake Utilities Corporation is a utility company that provides natural gas transmission and distribution, propane distribution, and information technology services. The Company distributes natural gas to residential, commercial, and industrial customers in Delaware, Maryland, and Florida. Chesapeake Utilities' propane is distributed to customers in Delaware, Maryland, and Virginia.
D US Equity	DOMINION ENERGY INC	Integrated	Dominion Energy, Inc. produces and transports energy products. The Company offers natural gas and electric energy transmission, gathering, and storage solutions. Dominion Energy serves customers in the United States.
DTE US Equity	DTE ENERGY COMPANY	Integrated	DTE Energy Company, a diversified energy company, develops and manages energy-related businesses and services nationwide. The Company, through its subsidiaries, generates, purchases, transmits, distributes, and sells electric energy in southeastern Michigan. DTE is also involved in gas pipelines and storage, unconventional gas exploration, development, and production.
DUK US Equity	DUKE ENERGY CORP	Integrated	Duke Energy Corporation is an energy company located primarily in the Americas that owns an integrated network of energy assets. The Company manages a portfolio of natural gas and electric supply, delivery, and trading businesses in the United States and Latin America.
ED US Equity	CONSOLIDATED EDISON INC	Integrated	Consolidated Edison, Inc., through its subsidiaries, provides a variety of energy related products and services. The Company supplies electric service in New York, parts of New Jersey, and Pennsylvania as well as supplies electricity to wholesale customers.

Ticker	Company Name	ERA Industry	Company Description
EIX US Equity	EDISON INTERNATIONAL	Electricity	Edison International, through its subsidiaries, develops, acquires, owns, and operates electric power generation facilities worldwide. The Company also provides capital and financial services for energy and infrastructure projects, as well as manages and sells real estate projects. Edison provides integrated energy services, utility outsourcing, and consumer products.
ENB US Equity	ENBRIDGE INC	Gas	Enbridge Inc. provides energy transportation, distribution, and related services in North America and internationally. The Company operates a crude oil and liquids pipeline system, is involved in international energy projects, and is involved in natural gas transmission and midstream businesses. Enbridge also distributes natural gas and electricity, and provides retail energy products.
ES US Equity	EVERSOURCE ENERGY	Integrated	Eversource Energy is a public utility holding company. The Company, through its subsidiaries, provides electric service to customers in Connecticut, New Hampshire, and western Massachusetts. Eversource Energy also distributes natural gas throughout Connecticut.
ETR US Equity	ENTERGY CORP	Electricity	Entergy Corporation is an integrated energy company that is primarily focused on electric power production and retail electric distribution operations. The Company delivers electricity to utility customers in Arkansas, Louisiana, Mississippi, and Texas. Entergy also owns and operates nuclear plants in the northern United States.
EVRG US Equity	EVERGY INC	Electricity	Evergy, Inc. provides electricity generation, transmission, and distribution services. The Company offers its services in the United States.

Ticker	Company Name	ERA Industry	Company Description
EXC US Equity	EXELON CORP	Integrated	Exelon Corporation is a utility services holding company. The Company, through its subsidiaries, distributes electricity to customers in Illinois and Pennsylvania. Exelon also distributes gas to customers in the Philadelphia area as well as operates nuclear power plants in states that include Pennsylvania and New Jersey.
FE US Equity	FIRSTENERGY CORP	Integrated	FirstEnergy Corp. operates as a public utility holding company. The Company, through its subsidiaries, generates, transmits, and distributes electricity, as well as offers exploration, production, and distribution of natural gas. FirstEnergy provides energy management and other energy related services.
HE US Equity	HAWAIIAN ELECTRIC INDS	Electricity	Hawaiian Electric Industries, Inc. is a diversified holding company that delivers a variety of services to the people of Hawaii. The Company's subsidiaries offer electric utilities, savings banks, and other businesses, primarily in the state of Hawaii.
IDA US Equity	IDACORP INC	Electricity	IDACORP, Inc. operates as a holding company. The Company, through its subsidiaries, generates, purchases, transmits, distributes, and sells electric energy in southern Idaho, eastern Oregon, northern Nevada, and Wyoming. IDACORP maintains electricity and natural gas marketing operations, as well as manages affordable housing projects and other real estate investments.
KMI US Equity	KINDER MORGAN INC	Gas	Kinder Morgan, Inc. of Delaware operates as a pipeline transportation and energy storage company. The Company owns and operates pipelines that transport natural gas, gasoline, crude oil, carbon dioxide, and other products, as well as terminals that store petroleum products and chemicals and handle bulk materials like coal and petroleum coke.
LNT US Equity	ALLIANT ENERGY CORP	Integrated	Alliant Energy Corporation provides public-utility services. The Company supplies electricity, natural gas, and water to residential and commercial customers. Alliant Energy serves customers in the States of Illinois, Iowa, Minnesota, and Wisconsin.

Ticker	Company Name	ERA Industry	Company Description
MGEE US Equity	MGE ENERGY INC	Integrated	MGE Energy, Inc. is a public utility holding company. The Company's principal subsidiary generates and distributes electricity to customers in Dane County, Wisconsin. MGE also purchases, transports, and distributes natural gas in several Wisconsin counties.
NEE US Equity	NEXTERA ENERGY INC	Electricity	NextEra Energy, Inc. provides sustainable energy generation and distribution services. The Company generates electricity through wind, solar, and natural gas. Through its subsidiaries, NextEra Energy also operates multiple commercial nuclear power units.
NFG US Equity	NATIONAL FUEL GAS CO	Gas	National Fuel Gas Company is an integrated natural gas company with operations in all segments of the natural gas industry, including utility, pipeline and storage, exploration and production, and marketing operations. The Company operates across the United States.
NI US Equity	NISOURCE INC	Integrated	NiSource Inc. is an energy holding company. The Company's subsidiaries provide natural gas, electricity, and other products and services to customers located within a corridor that runs from the Gulf Coast through the Midwest to New England.
NJR US Equity	NEW JERSEY RESOURCES CORP	Gas	New Jersey Resources Corporation provides retail and wholesale energy services. The Company's principal subsidiary, New Jersey Natural Gas Co., is a local distribution company serving customers in central and northern New Jersey.
NWE US Equity	NORTHWESTERN CORP	Integrated	NorthWestern Corporation, doing business as NorthWestern Energy, provides electricity and natural gas in the Upper Midwest and Northwest. The Company serves customers in Montana, South Dakota, and Nebraska.

Ticker	Company Name	ERA Industry	Company Description
NWN US Equity	NORTHWEST NATURAL HOLDING CO	Gas	Northwest Natural Holding Company operates as a holding company. The Company, through its subsidiaries, builds and maintains natural gas distribution system, as well as invests in natural gas pipeline projects. Northwest Natural Holding serves residential, commercial, and industrial customers in the United States, Canada, and Service Territory.
OGE US Equity	OGE ENERGY CORP	Integrated	OGE Energy Corp., through its principal subsidiary Oklahoma Gas and Electric Company, generates, transmits, and distributes electricity to wholesale and retail customers in communities in Oklahoma and western Arkansas. The Company, through Enogex Inc., operates natural gas transmission and gathering pipelines, has interests in gas processing plants, and markets electricity.
OGS US Equity	ONE GAS INC	Gas	ONE Gas, Inc. is a regulated natural gas utility. The Company distributes natural gas to customers in Oklahoma, Kansas, and Texas. ONE Gas serves the residential, commercial, industrial, transportation, and wholesale industries.
OKE US Equity	ONEOK INC	Gas	ONEOK, Inc. is a diversified energy company. The Company is involved in the natural gas and natural gas liquids business across the United States.
OTTR US Equity	OTTER TAIL CORP	Electricity	Otter Tail Corporation, through its utility business units, provides electricity and energy services to customers in Minnesota, North Dakota, and South Dakota. The Company expands its scope to include interest in manufacturing and plastics businesses. Otter Tail Corporation serve customers primarily in the United States.
PCG US Equity	P G & E CORP	Integrated	PG&E Corporation is a holding company that holds interests in energy based businesses. The Company's holdings include a public utility operating in northern and central California that provides electricity and natural gas distribution, electricity generation, procurement, and transmission, and natural gas procurement, transportation, and storage.

Ticker	Company Name	ERA Industry	Company Description
PEG US Equity	PUBLIC SERVICE ENTERPRISE GP	Integrated	Public Service Enterprise Group Incorporated is a public utility holding company. The Company, through its subsidiaries, generates, transmits, and distributes electricity and produces natural gas in the North Eastern and Mid Atlantic United States.
PNM US Equity	PNM RESOURCES INC	Electricity	PNM Resources Inc. is a holding company. The Company, through its subsidiaries, generates, transmits, and distributes electricity. PNM Resources serves customers in the State of New Mexico.
PNW US Equity	PINNACLE WEST CAPITAL	Electricity	Pinnacle West Capital Corporation is a utility holding company. The Company, through its subsidiary, provides retail and wholesale electric service to most of the State of Arizona. Pinnacle West Capital through a subsidiary, also is involved in real estate development activities in the western United States.
POR US Equity	PORTLAND GENERAL ELECTRIC CO	Electricity	Portland General Electric Company is an electric utility involved in the generation, purchase, transmission, distribution, and sale of electricity in Oregon. The Company also participates in the wholesale market by purchasing and selling electricity and natural gas to utilities and energy marketers.
PPL US Equity	PPL CORP	Integrated	PPL Corporation is an energy and utility holding company. The Company, through its subsidiaries, generates electricity from power plants in the north eastern and western United States, and markets wholesale and retail energy primarily in the north eastern and western portions of the United States, and delivers electricity in Pennsylvania and the United Kingdom.
RGCO US Equity	RGC RESOURCES INC	Gas	RGC Resources, Inc. and its subsidiaries distribute and sell natural gas and propane. The Company serves residential, commercial, and industrial customers in the Roanoke Valley and Bluefield areas of southwestern Virginia, as well as southern West Virginia.

Ticker	Company Name	ERA Industry	Company Description
SJI US Equity	SOUTH JERSEY INDUSTRIES	Gas	South Jersey Industries, Inc. is an energy services holding company. The Company provides regulated, natural gas service to residential, commercial, and industrial customers in southern New Jersey. South Jersey also markets total energy management services, including natural gas, electricity, demand-side management, and consulting services throughout the eastern United States.
SO US Equity	SOUTHERN CO/THE	Electricity	The Southern Company is a public utility holding company. The Company, through its subsidiaries, generates, wholesales, and retails electricity in the south eastern United States. The Company also offers wireless telecommunications services, and provides businesses with two-way radio, telephone, paging, and internet access services, as well as wholesales fibre optic solutions.
SPH US Equity	SUBURBAN PROPANE PARTNERS LP	Gas	Suburban Propane Partners, L.P. is a retail propane gas marketer that serves residential, commercial, industrial, and agricultural customers through service centres.
SR US Equity	SPIRE INC	Gas	Spire Inc. is a public utility company involved in the retail distribution of natural gas. The Company serves an area in eastern Missouri and parts of several other counties. Spire also operates underground natural gas storage fields and transports and stores liquid propane.
SRE US Equity	SEMPRA ENERGY	Integrated	Sempra Energy operates as an energy infrastructure company. The Company focuses on delivering sustainable energy to consumers, as well as invests in, develops, and operates transmission and distribution infrastructure in North America including California, Texas, Mexico, and the LNG export market.
SWX US Equity	SOUTHWEST GAS HOLDINGS INC	Gas	Southwest Gas Holdings, Inc. operates as a holding company. The Company, through its subsidiaries, provides natural gas operation, construction, and distribution services. Southwest Gas Holdings serves customers in North America.

Ticker	Company Name	ERA Industry	Company Description
TCP US Equity	TC PIPELINES LP	Gas	TC Pipelines, LP acquires, owns, and participates in the management of United States-based pipeline assets. The Company owns interest in the Northern Border Pipeline Company, the owner of an interstate pipeline system that transports natural gas from the Montana-Saskatchewan border to natural gas markets in the Midwestern United States.
UGI US Equity	UGI CORP	Gas	UGI Corporation distributes and markets energy products and services. The Company is a domestic and international distributor of propane. UGI offers natural gas and electricity and sells related products and services in the Middle Atlantic region of the United States.
UTL US Equity	UNITIL CORP	Integrated	Unitil Corporation, a public utility holding company, conducts a combination electric and gas utility distribution operation in north central Massachusetts and electric utility distribution operations in the seacoast and capital city areas of New Hampshire. The Company is also involved in energy planning, procurement, marketing, and consulting activities.
WEC US Equity	WEC ENERGY GROUP INC	Integrated	WEC Energy Group, Inc. operates as an electric and natural gas delivery company. The Company manages electric and natural gas distribution and transmission lines, as well as power plants. WEC Energy Group serves customers in Wisconsin, Illinois, Michigan, and Minnesota.
XEL US Equity	XCEL ENERGY INC	Integrated	Xcel Energy, Inc. provides electric and natural gas services. The Company offers a variety of energy-related services including generation, transmission, and distribution of electricity and natural gas throughout the United States. Xcel Energy serves customers in portions of Colorado, Michigan, Minnesota, New Mexico, North Dakota, South Dakota, Texas, and Wisconsin.

Appendix 5 Detailed Equity Beta estimates

Table 8: Equity beta estimates at benchmark leverage

Asset	OLS	LAD	Asset	OLS	LAD	Asset	OLS	LAD	Asset	OLS	LAD
Australia			**United States**								
APA	0.759	0.896	AEE	0.992	0.752	ETR	1.019	0.535	OTTR	1.472	1.443
AST	0.286	0.532	AEP	1.019	0.617	EVRG	1.067	0.583	PCG	1.366	0.980
DUE	0.466	0.430	AES	0.848	0.712	EXC	1.083	0.910	PEG	1.284	1.043
SKI	0.383	0.505	AGR	0.938	0.808	FE	0.872	0.582	PNM	1.283	0.636
Canada			ALE	1.378	0.986	HE	0.862	0.821	PNW	1.297	0.605
ACO	0.744	0.564	ATO	1.145	0.883	IDA	1.321	0.821	POR	1.140	0.719
ALA	1.502	1.205	AVA	1.014	0.470	KMI	1.276	1.303	PPL	1.311	0.789
AQN	1.070	0.961	BKH	1.203	0.745	LNT	1.179	0.884	RGCO	0.750	0.621
CU	1.011	0.777	CMS	0.927	0.613	MGEE	1.051	0.920	SJI	0.975	0.928
EMA	0.547	0.501	CNP	1.372	0.813	NEE	1.194	0.919	SO	1.000	0.696
FTS	0.643	0.639	CPK	1.056	0.887	NFG	0.972	0.929	SPH	1.115	0.681
H	0.612	0.665	D	0.837	0.548	NI	0.840	0.677	SR	0.951	0.612
SPB	1.333	1.343	DTE	1.158	0.654	NJR	1.219	1.161	SRE	1.103	0.705
United Kingdom			DUK	0.847	0.485	NWE	1.385	0.978	SWX	1.254	0.893
SSE	1.184	1.037	ED	0.695	0.445	NWN	0.928	0.754	TCP	0.835	0.860
NG	0.712	0.591	EIX	1.133	0.949	OGE	1.686	1.049	UGI	1.237	1.123
New Zealand			ENB	1.044	1.043	OGS	1.250	1.048	UTL	1.120	1.052
VCT	0.648	0.565	ES	1.198	0.784	OKE	2.545	1.755	WEC	1.124	0.699
									XEL	1.037	0.642