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Cost of capital topic paper

Part 4 Input Methodologies Review 2023 – Draft decision

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Associated documents

Publication date	Reference	Title
13 October 2022	ISBN 978-1-99-101241-8	Part 4 IM Review 2023 Framework paper
14 June 2023	ISBN 978-1-991085-04-7	Part 4 IM Review 2023 - Draft decision - Financing and incentivising efficient expenditure during the energy transition topic paper
14 June 2023	ISBN 978-1-991085-03-0	Part 4 IM Review 2023 - Draft decision - Cost of capital topic paper
14 June 2023	ISBN 978-1-991085-07-8	Part 4 IM Review 2023 - Draft decision - CPPs and In-period adjustments topic paper
14 June 2023	ISBN 978-1-991085-08-5	Part 4 IM Review 2023 - Draft decision - Transpower investment topic paper
14 June 2023	ISBN 978-1-991085-06-1	Part 4 IM Review 2023 - Draft decision - Summary and context paper
14 June 2023	ISBN 978-1-991085-05-4	Part 4 IM Review 2023 - Draft decision - Report on the Input methodologies review 2023 paper
14 June 2023	ISBN 978-1-991085-14-6	[Draft] Electricity Distribution Services Input Methodologies (IM Review 2023) Amendment Determination 2023 [2023] NZCC [XX]
14 June 2023	ISBN 978-1-991085-12-2	[Draft] Gas Distribution Services Input Methodologies (IM Review 2023) Amendment Determination 2023 [2023] NZCC [XX]
14 June 2023	ISBN 978-1-991085-13-9	[Draft] Gas Transmission Services Input Methodologies (IM Review 2023) Amendment Determination 2023 [2023] NZCC [XX]
14 June 2023	ISBN 978-1-991085-11-5	[Draft] Airport Services Input Methodologies (IM Review 2023) Amendment Determination 2023 [2023] NZCC [XX]
21 June 2023	ISBN 978-1-991085-10-8	[Draft] Transpower Input Methodologies (IM Review 2023) Amendment Determination 2023 [2023] NZCC [XX]
21 June 2023	ISBN 978-1-991085-09-2	[Draft] Transpower Capital Expenditure Input Methodology (IM Review 2023) Amendment Determination 2023 [2023] NZCC [XX]

All above documents can be found on our website.

Commerce Commission
Wellington, New Zealand

Glossary

Acronyms	Definition
the Act	Commerce Act 1986
AER	Australian Energy Regulator
AIAL	Auckland International Airport Limited
AMP	Asset Management Plan
ASCE	American Association of Civil Engineers
BARNZ	Board of Airline Representatives New Zealand Inc.
CAA	Civil Aviation Authority
Capex	Capital expenditure
CAPM	Capital Asset Pricing Model
CAR	Commission for Aviation Regulation
CEG	Competition Economics Group
CEPA	Cambridge Economic Policy Associates
CMA	Competition and Markets Authority
Commission	Commerce Commission
CPP	Customised Price-quality Path
DGM	dividend growth model
DPP	Default Price-quality Path
DPRY	Debt Premium Reference Year
EDB	Electricity Distribution Business
ENA	Electricity Networks Association
ERA	Economic Regulation Authority
FCM	Financial Capital Maintenance
Fibre IMs	Fibre IMs set under Part 6 of the Telecommunications Act 2001
Framework	IM Review decision-making framework
FTSE	Financial Times Stock Exchange
GDB	Gas Distribution Business
GDP	Gross Domestic Product
GPB	Gas Pipeline Business
GTB	Gas Transmission Business
ID	Information Disclosure
IMs	Input Methodologies (refers to Part 4 IMs which are the subject of the IM Review, unless identified otherwise)
IM Review	Input Methodologies Review 2023
IEC	Incenta Economic Consulting
IPP	Individual Price-quality Path
LPG	Liquefied petroleum gas

Acronyms	Definition
MEUG	Major Electricity Users Group
MGUG	Major Gas Users Group
MRP	Market risk premium
NPV	Net Present Value
NSS	Nelson-Siegel-Svensson
NZAA	New Zealand Airport Association
NZD	New Zealand Dollar
NZ	New Zealand
OIA	Official Information Act 1982
Ofgem	The Office of Gas and Electricity Markets
Ofwat	The Water Services Regulation Authority
Part 4	Part 4 of the Commerce Act 1986
PIE	Portfolio Investment Entity
PQ	Price-quality
PSE	price setting event
PwC	PricewaterhouseCoopers
QCA	Queensland Competition Authority
RAB	Regulated Asset Base
RCP	Regulatory Control Period
RORI	Rate of Return Instrument
S&P	Standard and Poor
SAIFI	System average interruption frequency index
SAIDI	system average interruption duration index
SBL-CAPM	Simplified Brennan-Lally CAPM
TAMRP	Tax-adjusted market risk premium
TCSD	Term Credit Spread Differential
TMR	Total market return
UK	The United Kingdom
UK CAA	UK Civil Aviation Authority
US	The United States of America
WACC	Weighted Average Cost of Capital
WIAL	Wellington International Airport Limited

Contents

Executive summary

Purpose of this paper

X1 The purpose of this paper is to explain in relation to the cost of capital topic:

X1.1 the issues identified within this topic area;

X1.2 our responses to these issues, which include our proposed changes to the input methodologies (**IMs**);

X1.3 the reasons for our responses;

X1.4 the steps we have taken to ensure that the cost of capital parameters remain fit for purpose given changes in the overall environment faced by suppliers since the IMs were last reviewed; and

X1.5 how we have taken stakeholders' submissions into account in considering the above and in reaching our draft decisions presented in this paper.

X2 This paper relates to electricity distribution businesses (**EDBs**), gas transmission business (**GTB**), gas distribution businesses (**GDBs**), Transpower and regulated airport services.

We invite your views

X3 We invite your submissions in response to our draft decisions on the IM Review, which are presented in our draft Report on the Review, draft topic papers, and draft IM amendment determinations. We intend to publish submissions we receive and invite cross-submissions on those submissions at that point.

X4 Submissions are due by 5pm on 19 July 2023. Cross-submissions are due by 5pm on 9 August 2023.[1]

X5 We list the components of our draft decision package for the IM Review at paragraph 1.1 below and outline how submissions and cross-submissions can be made from paragraph 1.20.

Overview of the Cost of capital topic

X6 We have reviewed our cost of capital IMs and consider they remain broadly fit for purpose. Our review included:

[1] The Transpower IM amendment determination and the Transpower Capex IM amendment determination will be published on 21 June, one week later than the rest of the draft decisions package. As with the other amendment determinations, a seven-week consultation period will apply for these two amendment determinations.

X6.1 re-examining the case for a trailing average cost of debt in response to the substantive stakeholder submissions on this;

X6.2 reviewing our approach to estimating the risk-free rate and debt premium;

X6.3 updating our estimates of beta and leverage to reflect more up-to-date information, including updating our sample of comparable companies;

X6.4 reviewing key parameter estimates such as the tax-adjusted market risk premium (**TAMRP**) in light of updated information; and

X6.5 reviewing the use of the 67th percentile of the Weighted Average Cost of Capital (**WACC**) for Price-quality (**PQ**) regulation of EDBs and Transpower and GPBs.

X7 Table X1 summarises our draft decisions on this topic, including the areas where our analysis has led us to propose changes to the IMs. We have made changes that we consider result in a better estimate of the cost of capital. The more accurate our estimate of the WACC, the better we are able to promote the purpose of Part 4 (**Part 4**) of the Commerce Act 1986 (**the Act**). These changes, as well as the parameters of the WACC that we consider do not need to change, are discussed in the following chapters.

Table X1 Summary of draft decisions in relation to the cost of capital

Draft decision	Reasons	Chapter
COST OF DEBT		
Maintain the current hybrid approach to estimating the cost of debt	The hybrid approach uses a prevailing estimate of the risk-free rate and a trailing average estimate of the debt premium. After reviewing the pros and cons of the hybrid approach versus the trailing average, we prefer retaining the hybrid approach primarily because it provides better incentives to invest compared with the trailing average approach.	Chapter 3
Maintain the current approach to estimating the risk-free rate	We consider the evidence supports retaining the current approach to estimating the risk-free rate, including linking the tenor of the risk-free rate to the regulatory period.	Chapter 3
Maintain the current approach to estimating the debt premium	We consider the evidence supports retaining the averaging method we use to estimate the debt premium and also retain the benchmark tenor of five years.	Chapter 3
Maintain the current spread premium of 7.5bps for the TCSD for energy businesses	We have reviewed the estimate of the spread premium using updated information and consider there is no reason to change the current value of 7.5bps.	Chapter 3
Maintain our current decision of not specifying a TCSD allowance for regulated airports services	We consider a TCSD allowance does not need to be specified in the IMs for regulated airports services because the impact of longer-term debt can be assessed at price setting events for airports.	Chapter 3
Maintain the allowance for debt issuance and associated costs at 20bps p.a., but allow debt issuance and associated costs at 25bps for a four-year regulatory period	Our review, including an updated confidential debt survey, supports the current allowance for debt issuance and associated costs. We also provide for a higher debt issuance and associated cost allowance for a four-year regulatory period.	Chapter 3
Maintain the current credit rating of BBB+ for EDBs/Transpower and GPBs	We see no reason to change the S&P long-term credit rating of BBB+ for energy businesses.	Chapter 3
Maintain the current credit rating of A- for airports	We see no reason to change the S&P long-term credit rating of A- for airports.	Chapter 3

Draft decision	Reasons	Chapter
COST OF EQUITY		
Update the equity beta estimate for EDBs/Transpower - from 0.60 to 0.59	This reflects updated comparator sample analysis.	Chapter 4
Update the equity beta estimate for GPBs - from 0.69 to 0.68	This reflects updated comparator sample analysis. We do not consider the evidence supports a separate comparator sample for gas and we propose to retain the uplift of 0.05 to the asset beta for GPBs compared to non-gas companies.	Chapter 4
Maintain the equity beta for airports at 0.74	This reflects updated comparator sample analysis (which led to changes in the asset beta and leverage but not the equity beta). We propose to remove the downward adjustment of 0.05 to the asset beta for specified airport services as the evidence no longer supports the adjustment.	Chapter 4
Update the TAMRP for GPBs - from 7.5% to 7.0%	This reflects an updated estimate.	Chapter 4
Maintain a TAMRP of 7.0% for EDBs/Transpower and Airports	This result reflects rounding from an updated TAMRP estimate of 7.1% to 7.0%.	Chapter 4
Maintain our current decision of not providing an allowance for equity issuance costs	The evidence provided to us so far indicates that an allowance for equity issuance costs for EDBs is not necessary. An allowance for equity issuance costs may be necessary for Transpower as a result of our draft decision to apply inflation indexation to its RAB; however, we will await submissions before considering this matter further.	Chapter 4
OTHER DECISIONS RELATED TO THE COST OF CAPITAL		
Use the 65th WACC percentile for EDBs and Transpower	Our review has concluded that the 65th percentile of the WACC for PQ regulation of EDBs and Transpower is more appropriate than the 67th percentile.	Chapter 6
Use the 50th WACC percentile for GPBs	Our review has concluded that it is appropriate to apply the 50th percentile of the WACC for PQ regulation of GPBs.	Chapter 6

Draft decision	Reasons	Chapter
Change the leverage estimate for EDBs/Transpower and GPBs - from 42% to 41%	This reflects updated comparator sample analysis.	Chapter 5
Change the leverage estimate for airports - from 19% to 26%	This reflects updated comparator sample analysis, and in particular the removal of firms from the sample that had very low or negative leverage.	Chapter 5
Changes to allow for a WACC for a four-year regulatory period for EDBs DPPs and Transpower's IPP	We previously amended the GPB IMs to allow for a WACC for a four-year regulatory period. We consider we should make the same change for EDBs DPPs and Transpower's IPPs to make sure we can determine an appropriate WACC in the event we apply a four-year regulatory period.	Chapter 6
Maintain the current standard error of the WACC as 0.0101 for EDBs and Transpower	Our updated estimate supports retaining the current estimate.	Chapter 5
Maintain the current standard error of the WACC as 0.0105 for GPBs	Our updated estimate supports retaining the current estimate.	Chapter 5
Change the standard error of the WACC for airports - from 0.0146 to 0.0153	This reflects an updated estimate.	Chapter 5
Maintain the current approach to tax rates	We see no reason to change the current approach to tax rates.	Chapter 5

X8 This topic paper forms part of our package of draft decisions papers on the Input Methodologies Review (**IM Review**). As part of the package of papers, we have also published:

X8.1 a summary paper of our draft decisions;

X8.2 a report on the review; and

X8.3 a framework paper.

Chapter 1 Introduction

Purpose of this paper

1.1 The purpose of this paper is to explain in relation to the cost of capital topic:

1.1.1 the issues identified within this topic area;

1.1.2 our responses to these issues, which include our proposed changes to the IMs;

1.1.3 the reasons for our responses;

1.1.4 the steps we have taken to ensure that the cost of capital parameters remain fit for purpose given changes in the overall environment faced by suppliers since the IMs were last reviewed; and

1.1.5 how we have taken stakeholders' submissions into account, in considering the above, and in reaching our draft decisions presented in this paper.

Our draft decision package for the IM Review

1.1 This paper forms part of a package of draft decisions papers on the IM Review. Alongside this paper, we have published and invite stakeholders' views on:

1.1.1 our draft EDB, GDB, GTB, and Airports IM amendment determinations.[2] We will take account of submissions on these amendment determinations. These documents, with changes in response to submissions as appropriate, will be finalised and will then give legal effect to our final IM decisions;

1.1.2 our draft Summary and Context paper;

1.1.3 our other topic papers, which explain our draft IM policy decisions relevant to the following key topics:

1.1.3.1 Financing and incentivising efficient expenditure during the energy transition;

1.1.3.2 CPP and in-period adjustment mechanisms;

1.1.3.3 Transpower investment; and

[2] The Transpower IM amendment determination and the Transpower Capex IM amendment determination will be published on 21 June, one week later than the rest of the draft decisions package. As with the other amendment determinations, a seven-week consultation period will apply for these two amendment determinations.

1.1.4 our draft Report on the IM Review, which summarises for every IM policy decision:

1.1.4.1 any changes we propose making;

1.1.4.2 where we have considered changes but not made them; and

1.1.4.3 where we have not found reason to consider changes.

Previously published papers and other materials relevant to this topic

1.2 On 23 February 2022 we published our Notice of Intention.[3]

1.3 On 20 May 2022 we published the IM Review Process and issues paper.[4]

1.4 On 13 October 2022 we published the Decision-making Framework paper.[5]

1.5 On 7 November we held our Forecasting and incentivising efficient expenditure for EDBs workshop.[6]

1.6 On 29 November we held our Price-quality path in-period adjustment mechanisms workshop where:

1.6.1 we provided stakeholders with discussion slides;[7] and

1.6.2 we asked follow-up questions from the workshop on 5 December.[8]

1.7 On 21 December 2022 we provided a Clarification note with respect to our Framework paper and s 5ZN of the Climate Change Response Act 2002.[9]

1.8 On 1 March 2023 we updated our notice of intention.[10]

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[3] Commerce Commission "Input Methodologies Review 2023: Notice of intention to commence IM Review" (23 February 2022).

[4] Commerce Commission "IM Review 2023 - Process and issues paper" (20 May 2022).

[5] Commerce Commission "IM Review 2023 - Decision-making Framework paper" (13 October 2022).

[6] Commerce Commission "IM Review 2023: Role of price-quality path in-period adjustment mechanisms - 'Workshop slides'" (7 November 2022).

[7] Commerce Commission "IM review 2023 – In period adjustment mechanisms – Workshop 'Discussion slides'" (29 November 2022).

[8] Commerce Commission "IM review 2023 – In period adjustment mechanisms – Workshop follow up questions" (5 December 2022).

[9] Commerce Commission "IM Review 2023 - Decision-making Framework Clarification note- s5ZN of the CCRA" (21 December 2022).

[10] Commerce Commission "IM Review 2023 – Amended Notice of intention for IM Review 2023" (1 March 2023).

Structure of this paper

1.9 This paper is divided into sections, each addressing a series of identified issues within the cost of capital topic. Each of the sections broadly follows the following structure:

1.9.1 description of the issue and how it was identified;

1.9.2 explanation of whether we propose changes in response to the issue;

1.9.3 explanation of our assessment of other potential responses to the issue; and

1.9.4 explanation of how we propose to update the other cost of capital parameters in that section.

1.10 In describing the issues and assessing proposed responses, we explain how we have taken stakeholders submissions into account and how they have helped to shape our draft decisions.

Introduction to this topic

1.11 The cost of capital is the expected financial return investors require from an investment given its risk. A more detailed explanation of what the WACC is, the role it plays in Part 4 regulation, and how it is calculated, was discussed in our 2016 IM Review.[11]

1.12 We identified a number of issues through consultation on our Process and issues paper and a consultation on a report prepared for us by Cambridge Economic Policy Associates (**CEPA**).[12] Our analysis was also informed by submissions, our confidential cost of debt survey, the expert reports prepared for us by Bela Enterprises, CEPA, and Dr. Martin Lally, and the expert reports prepared for us on behalf of submitters.[13] We have sought to address these issues and detail our approaches to dealing with them at the beginning of each section.

1.13 We have considered a list of expert reports when developing our draft decisions, including:

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[11] Commerce Commission "Input methodologies review decisions: Topic paper 4 – Cost of capital issues" (20 December 2016).

[12] Commerce Commission "Part 4 Input Methodologies Review 2023: Process and issues paper" (20 May 2022);CEPA "Report on Cost of Capital 2022/ 2023" (report to the Commerce Commission 'IM Review 2023' (29 November 2022).

[13] Bela Enterprises "Comment on the Auckland Airport Input Methodologies Submission Report Produced for the New Zealand Commerce Commission " (31 January 2023) [report to be published alongside our draft decisions]; CEPA "Report on Cost of Capital 2022/ 2023" (report to the Commerce Commission 'IM Review 2023' (29 November 2022).

1.13.1 CEPA – Review of cost of capital 2022/2023 – New Zealand Commerce Commission (29 November 2022).

1.13.2 Dr Martin Lally – Estimation of the TAMRP (10 April 2023).

1.13.3 Dr Martin Lally – Review of submissions on the risk-free rate and the cost of debt (17 March 2023).

1.13.4 CEPA – Review of cost of capital 2022/2023: response to submissions (15 May 2023).

1.13.5 Bela Enterprises – Comment on the Auckland Airport Input Methodologies submission (31 January 2023).

1.14 We have published three models alongside of our topic paper. These are:

1.14.1 R code for asset beta, leverage, and standard error estimation

1.14.2 A Nelson-Siegel-Svensson (**NSS**) spreadsheet model + explanation of regressions for estimating the Term Credit Spread Differential (**TCSD**).

1.14.3 A WACC percentile spreadsheet model + description.

1.15 We published CEPA's Review of the cost of capital 2022/2023 in December 2022.[14] We have published the other expert reports alongside this topic paper.

1.16 We have also drawn on previous analysis and expert reports from the 2010 IMs, the 2013 High Court decision, the 2014 amendment to the WACC percentile, the 2016 IM Review, and the 2020 fibre IMs set under Part 6 of the Telecommunications Act 2001 (**Fibre IMs**).

1.17 As we indicated in our Process and issues paper, we also need to determine specific values of the key parameters of the WACC calculation. We have sought to ensure that the parameters remain fit for purpose given changes in the overall environment faced by suppliers since the IMs were originally set and since the 2016 IM Review. The parameters have been updated using more recent data and our reasons for any amendments to the parameters follow the discussion of the identified issues in each section.

Who does this paper apply to?

1.18 This paper applies to the IM Determinations for:

[14] Commerce Commission "Part 4 Input Methodologies Review 2023: Process and issues paper" (20 May 2022).

1.18.1 EDBs;

1.18.2 GTBs;

1.18.3 GDBs;

1.18.4 Transpower; and

1.18.5 specified airport services.

1.19 Note that throughout this paper we use the term GPBs to refer to the gas pipeline businesses in general (i.e., inclusive of GTBs and GDBs).

How you can provide your views

Process and timeline for making submissions

1.20 Submissions on our draft decisions and their implementation in our draft IM amendment determinations are due by 5pm on 19 July 2023.[15] We will then invite cross-submissions by 5pm on 9 August 2023.[16] Cross-submissions should only focus on matters raised in submissions. We strongly discourage stakeholders from raising new matters via cross-submissions.

1.21 Submissions and cross-submissions can be made to the Input Methodologies Review 2023 mailbox (IM.Review@comcom.govt.nz). Please clearly indicate in your email subject line and submission which of our draft decisions your submission relates to.

1.22 We request that submitters clearly confirm in their submission and covering email that the submission can be published on our website and does not include confidential information. If your submission does include confidential information we set out our process below.

Confidentiality

1.23 The protection of confidential information is something the Commission takes seriously. If you need to include commercially sensitive or confidential information in your submission or cross-submission, you must provide us with both a confidential and non-confidential/public version of your submission that are clearly identified. We intend to publish the non-confidential/public version of all submissions we receive on our website. This also applies to cross-submissions.

[15] Ibid.

[16] Ibid.

1.24 You are responsible for ensuring that commercially sensitive or confidential information is not included in a public version of a submission or cross-submission that you provide to us.

1.25 All submissions and cross-submissions we receive, including any parts of them that we do not publish, can be requested under the Official Information Act 1982. This means we would be required to release material that we do not publish unless good reason existed under the Official Information Act 1982 to withhold it. We would normally consult with the party that provided the information before we disclose it to a requester.

Chapter 2 Framework and context

Purpose and structure of this chapter

2.1 This chapter highlights key elements of our IM Review decision-making framework (**Framework)** and contextual factors that are most relevant to our draft decisions on the cost of capital.

Decision-making framework

2.2 In identifying which IMs to consider changing, and in reaching draft decisions on changing IMs, we are guided by three overarching objectives for the IM Review. We will only change an IM if it appears likely to meet one or more of the overarching objectives:[17]

2.2.1 promoting the Part 4 purpose in s 52A more effectively;

2.2.2 promoting the IM purpose in s 52R more effectively (without detrimentally affecting the promotion of the s 52A purpose); and

2.2.3 significantly reducing compliance costs, other regulatory costs, or complexity (without detrimentally affecting the promotion of the s 52A purpose).

2.3 Our individual draft decisions on the cost of capital IM are aimed at contributing towards determining an estimate of a cost of capital that will achieve the Part 4 purpose while still promoting certainty for regulated suppliers and consumers in relation to the rules, requirements, and processes applying to regulation under Part 4.[18]

2.4 We consider that the most relevant outcomes of the s 52A purpose for the cost of capital IM are:

2.4.1 s 52A(1)(a) – that regulated suppliers have incentives to innovate and to invest, including in replacement, upgraded, and new assets; and

2.4.2 s 52A(1)(d) – that regulated suppliers are limited in their ability to extract excessive profits.

2.5 We have also considered whether our cost of capital IM decisions promote the outcomes in s 52A(1)(b) and s 52A(1)(c):

[17] Commerce Commission "IM Review 2023 - Decision-making Framework paper (13 October 2022), para X20.

[18] Ibid, X21.1.

2.5.1 s 52A(1)(b) - that regulated suppliers have incentives to improve efficiency and provide services at a quality that reflects consumer demands; and

2.5.2 s 52A(1)(c) - that regulated suppliers share with consumers the benefits of efficiency gains in the supply of the regulated goods or services, including through lower prices.

2.6 In reaching our draft decisions we have aimed to strike an appropriate balance between the s 52A outcomes.

2.7 In this regard, we consider that reaching our best estimate of each of the WACC parameters will help to ensure the objectives in s 52A(1)(a) to (d) are balanced and promoted appropriately.

Key economic principles

2.8 The Framework paper also describes key economic principles that can provide guidance as to how we might best promote the Part 4 purpose.

2.9 The key economic principles most relevant to this topic paper are:

2.9.1 ex-ante real financial capital maintenance (**FCM**) and FCM's practical application in the form of Net Present Value (**NPV**)=0[19]; and

2.9.2 any asymmetric consequences to consumers, over the long-term, of under-investment versus higher prices, which we consider under the WACC percentile.

2.10 For further detailed discussion on the Framework, please see the IM Review 2023 Decision Making Framework paper.[20]

Context

2.11 The cost of capital is the expected financial return investors require from an investment given its risk. Investors have choices and will not invest in an asset unless the expected return is at least as good as the return they would expect to get from a different investment of similar risk.

2.12 There are two main types of capital: debt and equity capital. Both have a cost from the perspective of the entity that is seeking funds from investors. For debt, it is future interest payments. For equity, it is the expectation of dividend payments by the firm, and where profits are retained and reinvested, the expectation of larger dividend payments by the firm sometime in the future.

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[19] Ibid, X24.1-X24.2 and 4.26.

[20] Commerce Commission "IM Review 2023 - Decision-making Framework paper (13 October 2022).

2.13 The WACC reflects the cost of debt and the cost of equity, and the respective portion of each that is used to fund an investment.

2.14 The cost of capital IM comprises two parts:

2.14.1 The first and most significant component is a method for calculating the WACC. The WACC is determined for each regulated service and applies to all regulated suppliers of that service; and

2.14.2 The second component is the TCSD, which is treated as an adjustment to cash flow and will apply to qualifying firms only.

2.15 The detailed explanation of the WACC and cost of capital IM has been discussed in our 2016 IM Review.[21]

2.16 As part of the IM Review process, through our Process and issues paper and CEPA report on cost of capital, we identified a number of important issues that we prioritised in reviewing the cost of capital IM. In addition to these identified issues, we have also sought to ensure that all the parameters remain fit for purpose given changes in the overall environment faced by suppliers both since the IMs were originally set, and since the 2016 IM Review.

2.17 We consider that our draft decisions enable us to estimate a cost of capital that is reasonable and commercially realistic while maintaining consistency with s 52R and not increasing complexity or compliance costs. Our changes to the cost of capital are based for the most part on access to updated data, including of comparator samples, which has allowed us to update parameter estimates. Our view is that the associated revisions to the cost of capital parameter estimates in the IMs will better promotes the s 52A purpose.

[21] Commerce Commission "Input methodologies review decisions: Topic paper 4 – Cost of capital issues" (20 December 2016).

Chapter 3 Cost of debt

Purpose and structure of this chapter

3.1 The purpose of this chapter is to explain our draft decisions on:

3.1.1 the main issues raised in relation to the cost of debt;

3.1.2 our review of the parameters that make up the cost of debt; and

3.1.3 explain the reasons for our draft decisions.

The structure of this chapter is as follows

3.2 This chapter begins with a summary of our draft decisions with respect to the cost of debt.

3.3 The chapter then outlines our current approach to estimating the cost of debt, followed by an analysis of each element that is part of the cost of debt estimate.

3.4 For each element, the chapter discusses the main issues raised in submissions in relation to our approach to estimating that element and sets out our responses.

3.5 We discuss the following key areas in sequence:

3.5.1 risk-free rate, including consideration of a trailing average approach to estimating the risk-free rate (as proposed by some suppliers);

3.5.2 the debt premium;

3.5.3 the TCSD;

3.5.4 debt issuance and associated costs; and

3.5.5 other matters related to estimating the cost of debt.

Draft decisions for estimating the cost of debt

3.6 We maintain our current approach to estimating the cost of debt. That is, we estimate the cost of debt as the sum of the risk-free rate, the debt premium and debt issuance and associated costs.

3.7 Our current approach to estimating the cost of debt is a hybrid approach which uses prevailing rates ('the prevailing approach') for determining the risk-free rate and a historical average estimate ('the trailing average approach') for determining the debt premium.

3.8 Our draft decision is to maintain our current prevailing approach to estimating the risk-free rate.

3.8.1 We will estimate the risk-free rate using a three-month average of prevailing interest rates at the time each PQ and Information Disclosure (**ID**) WACC determination is made; and

3.8.2 The risk-free rate will be estimated from the wholesale market linearly interpolated bid yield to maturity of notional benchmark New Zealand government New Zealand dollar denominated nominal bonds with a residual period to maturity equal to the regulatory period.

3.9 Our draft decision is to maintain our current trailing average approach to estimating the debt premium.

3.9.1 We will determine the average debt premium for each disclosure year for ID regulation, and for each regulatory period for PQ regulation.

3.9.2 The average debt premium will be a simple arithmetic average of five annual debt premium values, estimated for the current Debt Premium Reference Year (**DPRY**) and four previous DPRYs.[22]

3.9.3 We will determine the annual debt premium for each DPRY for PQ and ID regulation. The annual debt premium will be estimated as the difference between the risk-free rate and the yield on publicly traded corporate bonds (for EDBs/Transpower and GPBs with a Standard and Poor's (**S&P**) long-term credit rating of BBB+, and for airports with a S&P long-term credit rating of A-), with a remaining term to maturity of five years.

3.10 We maintain our current allowance for debt issuance and associated costs of 20 bps p.a. for a five-year regulatory period but allow for an upward adjustment for a four-year regulatory period (25 bps p.a.).

3.11 Our draft decision on the TCSD is to:

3.11.1 maintain a spread premium of 7.5 bps for energy businesses; and

3.11.2 maintain the decision of not specifying a TCSD value for airports in the IMs, (i.e., leaving for a price setting event (**PSE**)).

[22] For detail about the DPRY, please see: Commerce Commission "Guidelines for WACC determinations under the cost of capital input methodologies" (January 2023), p. 19.

Introduction

3.12 Our current approach to estimating the cost of debt is by observing the risk-free rate proxied by the interest rate paid by the New Zealand Government, and the additional premium corporate borrowers pay to compensate investors for the additional risks of lending to them (relative to the Government debt). We also allow for the costs of issuing debt, and the cost of entering interest rate swaps to alter the term of the debt and better align it to the length of the regulatory period.[23]

3.13 We use a 'simple approach' to estimating the cost of debt, that is, we only consider credit-rated publicly traded corporate bonds denominated in New Zealand dollars when estimating the debt premium and debt issuance and associated costs.[24]

3.14 A separate TCSD allowance is calculated for qualifying suppliers reflecting the additional costs associated with holding a longer-term debt portfolio (above the five-year term allowed for in the debt premium).[25] The TCSD is used to adjust cash flows under ID and Default Price-quality Path (**DPP**) regulation and is applied to allowable revenue calculations in CPP regulation. A TCSD does not apply for Airports, but we can take Airports' specific circumstances into account as part of the PSE reviews.

3.15 We received several submissions on issues in relation to our approach to estimating the cost of debt, risk-free rate, debt premium, TCSD, debt issuance and associated costs, and credit rating. We discuss these issues below.

Risk-free rate

Our method

3.16 The risk-free rate is an input in estimating both the cost of debt and the cost of equity. We use the same approach to estimating the risk-free rate for both debt and equity.

3.17 Our overall approach to estimating the risk-free rate involves the following considerations:

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[23] We use a benchmark cost of capital including debt issuance and associated costs in setting the price path. Supplier actual financing costs and debt issuance costs are excluded from the expenditure allowances in the price path because these are recovered through the return on capital (ie, through the cost of capital).

[24] In principle, there are two generic ways of estimating the cost of debt. The ‘simple approach’ only considers credit-rated publicly traded corporate bonds denominated in New Zealand dollars. The ‘complex approach’ acknowledges that firms may raise debt capital through a number of channels in addition to issuing bonds in New Zealand.

[25] Qualifying suppliers are suppliers which have a debt portfolio with a weighted average original tenor exceeding the tenor of the debt premium.

3.17.1 identify a suitable proxy, as the risk-free rate is not observable in practice;

3.17.2 decide whether to use the prevailing risk-free rate or an historical average of the risk-free rate;

3.17.3 decide whether to use spot rates (zero coupon rates) or yields to maturity on New Zealand government coupon paying bonds as a proxy for spot rates;

3.17.4 decide the determination window of the risk-free rate; and

3.17.5 determine the appropriate maturity of the rate.

3.18 Our detailed steps for estimating the risk-free rate are set out in our WACC guidelines.[26]

Issues raised in submissions

3.19 We have received several submissions in relation to our method for estimating the risk-free rate (as discussed in paragraph 3.17 above). These are summarised below.

Prevailing versus trailing average approach

3.20 We received several submissions from regulated suppliers who prefer the trailing average approach to estimating the risk-free rate. They raised two main issues that are related to the use of the prevailing approach to estimating the risk-free rate:

3.20.1 Large suppliers may not be able to enter swap contracts for the risk-free rate component within the refinancing window specified by the Commission due to the market disruption caused by the large size of their contracts. Therefore, suppliers may be exposed to the risk that their cost of debt will not match the regulatory benchmark allowance.[27]

3.20.2 The volatility of the risk-free rate component of the debt proportion of the WACC introduces volatility into regulatory determinations, which results in volatility in allowed revenues for regulated suppliers and prices for consumers between regulatory control periods.[28]

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[26] Commerce Commission "Guidelines for WACC determinations under the cost of capital input methodologies" (January 2023), pp. 14-15.

[27] Submissions by Chorus, Transpower on the Commerce Commission "IM Review 2023 - Process and issues paper" (20 May 2022), and Commerce Commission "IM Review 2023 - Draft Framework paper" (20 May 2022). Submissions available on our website.

[28] Submissions by Chorus, ENA, First Gas, Transpower, Unison, Vector on the Commerce Commission "IM Review 2023 - Process and issues paper" (20 May 2022), and Commerce Commission "IM Review 2023 - Draft Framework paper" (20 May 2022); and the Oxera (report prepared for 'Big 6' EDBs) and CEG (report

Annual updating of the risk-free rate

3.21 The Oxera report commissioned by the 'Big 6' EDBs proposed that the risk-free rate used in setting the allowed cost of debt be reset annually during a regulatory period so as to reduce the exposure of the EDBs to market movements in interest rate risks.

3.22 Oxera considered that the upward pressure on rates and the volatility of interest rates introduced uncertainty about movements in the market which are beyond companies' control, and annual updating of the risk-free rate as well a number of tools (e.g., pass-through mechanisms, 'true-ups', triggers or reopeners to instigate changes to allowances within the period) could be used to reduce suppliers' exposure to interest rate risk.[29]

Term of the risk-free rate

3.23 The Oxera report proposed that the Commission considers a range of evidence on yields of government bonds with maturities between five and 20 years.[30]

Our consideration of the trailing average approach

3.24 The trailing average was a key topic in submissions. The issues noted in paragraph 3.20 above in relation to the trailing average approach were raised by suppliers in the 2016 IM Review, and we provided detailed responses in our 2016 final reasons paper.[31] We note that suppliers have not provided substantial new evidence in their current submissions. Nevertheless, we provide a detailed analysis of the proposed trailing average approach and address the two issues below in detail.

The prevailing versus trailing average approach

3.25 In the 2016 IM Review, we retained the prevailing approach to estimate the risk-free rate element of the cost of debt. We maintained our view from 2010 that using prevailing rates enables firms to achieve a normal return on their investment, promotes the potential dynamic efficiency benefits of investment and, therefore, better promotes the Part 4 purpose.

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prepared for Electricity Networks Association - Appendix C) submissions on the CEPA "Report on Cost of Capital 2022/ 2023" (report to the Commerce Commission 'IM Review 2023' (29 November 2022). Submissions available on our website.

29 Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), pp. 11, 15-16.

30 Ibid, pp. 11-13.

31 Commerce Commission "Input methodologies review - Topic paper 4: Cost of capital issues" (20 December 2016), paras 85-137.

3.26 An alternative approach is to estimate the risk-free rate by reference to long-term average historical interest rates (the trailing average approach). We recognise that the efficient debt financing strategy of a supplier is to issue debt with staggered maturity dates to minimise the potentially significant refinancing risk associated with having to refinance a large portion of debt at any one particular time. The trailing average approach seeks to replicate this efficient debt financing practice.[32]

3.27 If we were to adopt a trailing average approach to estimate the risk-free rate, it would be a simple (equally weighted maturities) trailing average with a five-year term for the risk-free rate that matches the term for the trailing average debt premium.

3.28 Regulated suppliers submitted that a staggered portfolio reflects the need to finance investment in long-lived assets, and to spread borrowing requirements over time to reduce overall refinancing risk. We recognised this point when adopting the trailing average approach for the debt premium in the 2016 IM Review.[33]

3.29 Regulated suppliers have again proposed in this review that we switch to the trailing average approach to estimating the risk-free rate. Below we discuss the two main concerns raised in submissions in relation to the prevailing approach.

Issue 1: The difficulty of hedging the risk-free rate volatility

3.30 Suppliers, in particular Chorus and Transpower, submitted that there are difficulties using interest rate swaps.[34]

3.31 Incenta Economic Consulting (**IEC**) in its report for Chorus states:[35]

> We note that the Commission has emphasised in past decisions that its cost of debt allowance – in which the risk-free element is determined with reference to spot rates around the time of determination – can also be replicated by firms using interest rate swaps to lock-in that spot risk-free rate. However, we understand that the size of Chorus relative to the New Zealand market is likely to make this hedging activity infeasible. Chorus, and other large, regulated firms, may therefore face a considerable mismatch between the allowance received for the cost of debt and the embedded cost.

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[32] For example, a simple trailing average cost of debt averaged over 10 years assumes that all debt is issued for a term of 10 years and 10 per cent of the total debt is refinanced each year.

[33] However, we consider that the prevailing approach is also consistent with the assumed debt management strategy. The main difference is that a firm's efficient debt financing practice involves the use of interest rate swaps under the prevailing approach and no use of interest rate swaps under the trailing average approach. As we found in our confidential debt surveys for the current IM Review, the use of interest rate swaps is a common practice among regulated suppliers under the current regime.

[34] Submissions by Chorus, Transpower on the Commerce Commission "IM Review 2023 - Process and issues paper" (20 May 2022), and Commerce Commission "IM Review 2023 - Draft Framework paper" (20 May 2022). Submissions available on our website.

[35] Incenta Economic Consulting "Measures to improve the stability in WACC estimates" (report prepared for Chorus, 11 July 2022), p. 2.

3.32 Transpower states:[36]

> The trailing average approach, implemented well, will go a considerable way to addressing the main problems with the current rate-on-the-day methodology. These problems include:
>
> 1. Large exposures to refinancing risks implicit in the current approach
>
> 2. Market disruption (i.e., elevated spreads, inability to hedge risk) due to the narrow refinancing window assumed
>
> 3. Inability of prudent and efficient suppliers to match their actual debt service costs to the regulatory allowance.

3.33 We addressed this issue in detail in our 2010 and 2016 IM Reviews. In particular, we noted that we had been provided with limited evidence that suggests the interest rate swap market is significantly affected by the actions of the regulated suppliers concentrating hedging in a small determination window.

3.34 Firms in general have a mix of debt maturities to manage refinancing risk, including issuing long-term debt, but long-term debt typically has a greater cost than medium or short-term debt. The use of interest rate swaps allows firms to adjust the period for which their interest rate is fixed, generally in order to benefit from a lower rate of interest, while bearing some interest rate risk during refinancing. The use of interest rate swaps allows a firm to choose the interest rate re-pricing period it faces, independent of the maturity date of the debt.

3.35 As part of the evidence that we gathered for this review, we conducted a confidential debt survey. We asked businesses about their current debt portfolio and use of swaps to hedge interest rate exposure. The information on debt profiles that we obtained from regulated suppliers in New Zealand shows that they are able to use interest rate swaps to achieve greater alignment of their interest rate re-pricing periods with the regulatory periods.[37]

3.36 Figure 3.1 compares the weighted average original tenor for regulated suppliers' debt with the weighted average interest rate re-pricing period for that debt, based on our 2022 confidential debt survey. The data on the actual interest rate repricing period faced by regulated suppliers illustrates regulated suppliers' ability to use swaps to alter their interest rate repricing period and align it more closely with the regulatory period.

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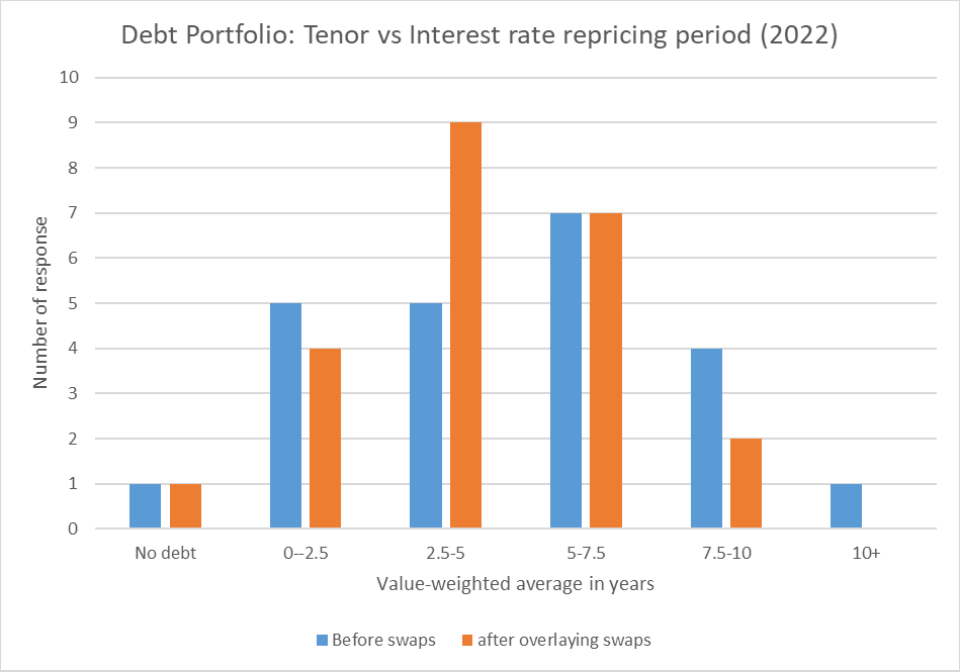
[36] Transpower NZ Ltd "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), pp. 19-20.

[37] We understand that some regulated suppliers choose to use interest rate swaps to seek alignment with the regulatory period and some do not.

Figure 3.1 Regulated Suppliers' Debt Portfolios: Tenor vs. Interest Rate Repricing Period



Source: New Zealand Commerce Commission analysis of 2022 confidential debt survey.

3.37 In the 2016 IM Review, we decided to extend the risk-free rate determination period from a one-month window to three months, to mitigate some concern in submissions that suggest the swap market is significantly affected by the actions of the regulated suppliers concentrating hedging in a small determination window. In response to that decision, submissions agreed that this concern has been alleviated to some degree by the extension of the determination window to three months.

3.38 Overall, the evidence before us suggests that regulated suppliers can use interest rate swaps to materially hedge their risk-free rate exposure without significant hurdles. Our three-month determination window for the risk-free rate further mitigates the difficulty of hedging.

Issue 2: Volatility of returns and prices

3.39 A number of suppliers submitted that the prevailing approach would result in volatile estimates of the WACC that can change significantly from one regulatory period to another.[38] They suggested that the volatility affected their own costs and it also has a detrimental impact on consumers who may be subject to significant price changes between regulatory periods.

[38] Submissions by Chorus, ENA, First Gas, Transpower, Unison, Vector on the Commerce Commission "IM Review 2023 - Process and issues paper" (20 May 2022), and Commerce Commission "IM Review 2023 - Draft Framework paper" (20 May 2022), and the Oxera (report prepared for 'Big 6' EDBs) and CEG (report

3.40 First Gas suggests:[39]

> To better align with how debt is raised in practice and to reduce price and revenue volatility, we consider that the Commission should adopt a trailing average approach to estimate the cost of debt.

3.41 Transpower states:[40]

> The trailing average approach, implemented well, will go a considerable way to addressing the main problems with the current rate-on-the-day methodology. These problems include: ... 4. Volatility in transmission prices between Regulatory Control Periods (**RCPs**).

3.42 The Electricity Networks Association (**ENA**) states:[41]

> The current on-the-day approach to cost of debt can result in step changes in MAR between regulatory periods, as noted in chapter 5 of the Process and issues paper. The Commission should examine if the approach to estimating the cost of debt (trailing average) used in other jurisdictions (most notably the **AER**) would address this issue.

3.43 Unison suggests:[42]

> These extremes have highlighted that the approach to setting the risk-free rate on a three month window potentially can cause quite volatile outcomes that then become locked in for a five year period. It is not evident that this concentration risk is to the long-term benefit of consumers and we think the Commission should reconsider the appropriate measurement window for the risk-free rate.

3.44 Competition Economics Group (**CEG**), in a report for ENA, states:[43]

> In our view, the trailing average approach is to be preferred because it is simpler to hedge to and is more stable (which benefits both EDBs and customers).

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prepared for Electricity Networks Association - Appendix C) submissions on the CEPA "Report on Cost of Capital 2022/ 2023" (report to the Commerce Commission 'IM Review 2023' (29 November 2022). Submissions available on our website.

39 First Gas Limited "Submission on IM Review Process and Issues paper and draft Framework paper" (13 July 2022), p. 25.

40 Transpower NZ Ltd "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), pp. 19-20.

41 ENA "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), p. 14.

42 Unison – "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), p. 16.

43 CEG "Estimating the WACC under the IMs" 'Appendix C -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, February 2023), p. 8.

3.45 We agree with submissions that the main benefit of the trailing average approach is that it would support greater price stability between regulatory periods. However, we consider that we have tools other than the WACC for smoothing prices at PQ resets, as per s 53P (8).[44] In particular, we can apply the rate of change mechanism across a control period to smooth prices to mitigate any significant impacts on consumers.[45]

3.46 In regard to the impact on consumers, we note that submissions focused on price stability between regulatory periods. However, price stability within a regulatory period is also important.

3.47 Our review of the annual revenue wash-up found that revenue and price stability within a regulatory period can be improved by aligning the assumptions underlying the revenue washup mechanism with the assumptions underlying the hybrid cost of debt (prevailing risk-free rate and trailing average debt premium).

3.48 Our proposed change to the annual revenue wash-up will account for debt servicing costs being fixed in nominal terms. We have demonstrated in our modelling, published with this draft decision, that this change to the annual revenue wash-up is consistent with the NPV=0 condition.[46] We discuss this change in detail in chapter 5 of the Financing and Incentivising Efficient Expenditure during the Energy Transition topic paper.[47]

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[44] The Act s 53P (8):

The Commission may set alternative rates of change for a particular supplier—

(a) as an alternative, in whole or in part, to the starting prices set under sub-section (3)(b) if, in the Commission's opinion, this is necessary or desirable to minimise any undue financial hardship to the supplier or to minimise price shock to consumers.

[45] For example, in our Gas DPP3 Decisions, we have smoothed prices over DPP3 to minimise price rises for consumers of gas pipeline services. For details please see: Commerce Commission "Default price-quality paths for gas pipeline businesses" (1 October 2022). Final Reasons Paper" (May 2022), p. 15.

[46] For example, when out-turn inflation is higher than expected, the annual revenue wash-up would not increase revenue for the entire amount of inflation, but rather a lesser amount to exclude the effect inflation would otherwise have on the cost of debt (without the adjustment suppliers would be compensated as if their cost of debt had increased with inflation)

[47] Commerce Commission "Part 4 Input methodologies Review 2023 - Draft decision - Financing and incentivising efficient expenditure during the energy transition topic paper" (14 June 2023), chapter 5.

3.49 In comparison, under a trailing average approach, forecast revenue would be based on an assumption of the cost of debt for the regulatory period, but this would likely be inconsistent with the debt servicing costs incurred by the supplier.[48] We consider it is more straightforward to achieve revenue and price stability during a regulatory period under the hybrid approach than under the trailing average approach.[49]

3.50 An important consideration in setting the WACC is estimating the opportunity cost of capital. We consider that the stability of expected returns associated with the trailing average could weaken the signals with respect to new investment in infrastructure. As the cost of debt calculated using a trailing average is based on mostly historical interest rates which generally depart from the current market conditions, it does not represent an expected return that reflects the opportunity cost of new investment.

3.51 There is debate about the extent that the cost of debt should reflect the opportunity cost of new investment. For example, in the Australian Energy Regulator (**AER**)'s 2022 Rate of Return Instruments (**RORI**) concurrent evidence session, various views were provided on this issue.

3.51.1 Prof Partington considered that the NPV=0 principle requires the use of current opportunity cost of debt determined by the capital market and this is the rate to be applied to new investments.[50]

3.51.2 Dr Hird considered that a properly weighted trailing average approach does not create incentive distortions even when the trailing average rate differ from the prevailing rate, because any financing costs incurred today would enter into Regulated Asset Base (**RAB**) and be recovered over the trailing average period.[51]

3.52 Prof Partington and Dr Lally share the view that new investment should use the prevailing cost of debt. Dr Hird's argument, on the other hand, seems to suggest that the opportunity cost of debt is less important for an investment decision than whether the firm recoups its debt financing costs.

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[48] For example, the cost of debt for the regulatory period could be set at a certain level but the trailing average cost of debt could increase (or decrease) gradually over the regulatory period.

[49] And therefore, it is also more complicated, using our modelling approach, to demonstrate NPV=0 is achieved under the trailing average method. However, we consider it would be possible to design an annual revenue wash-up that adjusted for the difference between the assumed cost of debt and the trailing average cost of debt, but it would require an annual update to the cost of debt (or a wash-up at the end of the regulatory period).

[50] AER "Rate of Return Instruments Concurrent Evidence Session 2" (February 2022), pp. 48-52.

[51] Ibid, pp. 81-82.

3.53 We note that this debate partly depends on whether the trailing average method can be designed in a way that assigns the appropriate weight to new capital expenditure (**capex**). However, when there is large new capex relative to historic capex, there is a practical issue with the trailing average approach in relation to the weighting assigned to new capex which we discuss in paras 3.58 to 3.60. As it is likely that annual capex for Transpower and the EDBs over the next few regulatory periods will be greater than in the past, this practical issue becomes a more significant concern. As we note in the next section, attempting to apply appropriate weightings can introduce significant implementation issues (see the AER discussion).

3.54 In general, we are mindful that when making investment decisions, investors compare the expected return on an asset with their opportunity cost for that investment, and the opportunity cost is typically reflected in the current market rates. While we agree that it is important that our regulatory settings provide ex ante NPV=0, this does not mean that firms need to have the recovery of their actual debt financing costs assured.

Potential implementation issues with the trailing average approach

3.55 If we were to adopt a trailing average approach applying to both the risk-free rate and the debt premium, we would need to consider a number of practical implementation issues, including:

3.55.1 requiring an estimate of an efficient benchmark term of debt;

3.55.2 the choice between a simple or a weighted trailing average;

3.55.3 the possible need for a transitional arrangement to ensure no windfall gains or losses due to the regime change; and

3.55.4 other potential adjustments such as annual updating of the debt allowance, all of which would introduce additional complexity and potential errors.

3.56 Lally (2013) and Lally (2016) pointed out that a benchmark debt term under a trailing average approach requires knowledge of the interest rate swap contracts that the regulated firm would have entered into in the absence of regulation, in order to determine the effective risk-free rate term on their debt in the absence of regulation, and this is not observable. Thus, in respect of the risk-free rate component of the cost of debt, the benchmark debt maturity under the trailing average approach is indeterminable.[52, 53]

3.57 Lally (2023) again noted that the difficulty in determining the benchmark efficient debt term is more challenging with the trailing average approach than with the Commission's hybrid approach because errors in estimating the correct term for the trailing average approach affect the entire cost of debt rather than just the debt premium. The estimation errors of benchmark debt term would lead to an allowed cost of capital that is too high or too low.[54]

3.58 We also note that the simple (equally weighted) trailing average approach is unlikely to reflect suppliers' efficient debt costs if there are large, uneven amounts of capex (and associated debt raising that departs from the assumed benchmark capital structure) during a regulatory period. This issue is particularly pertinent now with the expected large increase in capex with electrification in New Zealand.

3.59 The AER noted that this mismatch would generally result in a departure from the NPV=0 condition and could lead to an inefficient outcome. [55] The AER's concern highlights the conceptual problem of the trailing average approach, ie, relying on the historical rates does not reflect the opportunity cost of capital and may not provide proper incentives for efficient new investment.

3.60 The AER has considered introducing a weighted trailing average to address the problem identified above but decided against it in its latest RORI review decision. The AER decided against a weighted trailing average due to the lack of clarity in regard to a benchmark entity's efficient debt financing practice for the potential large capital investments, as well as significant practical difficulties of implementing a weighted trailing average approach.[56] We consider that the AER's decision reflects the uncertainties with some key assumptions underlying the support for a trailing average, in this case a benchmark entity's efficient debt financing practice.

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[52] Lally "Estimating the cost of debt of the benchmark efficient regulated energy network business" (August 2013), p. 11.

[53] Lally "Review of further WACC issues" (May 2016), p. 23.

[54] Lally "Review of submissions on the risk-free rate and the cost of debt" (report to the Commerce Commission, 17 March 2023), p. 3.

[55] AER "Rate of Return Instrument Explanatory Statement" (February 2023), pp. 233-234.

[56] Ibid, pp. 235-236.

Our conclusion on the trailing average approach

3.61 We have considered the proposed change to the trailing average approach for the cost of debt. The trailing average has the advantage of smoothing the volatility in the estimated risk-free rate between regulatory periods, which tends to lead to more stable allowed cost of debt and prices for consumers over time. The trailing average approach also reduces the need for regulated suppliers to hedge the interest rate exposure as the allowance aims to match their efficient costs under the assumed benchmark debt portfolio.[57]

3.62 On the other hand, the prevailing approach uses more up-to-date estimates of interest rates and therefore better represents the opportunity cost of capital. Using prevailing rates means that changes in expectations in the financial markets will be signalled more rapidly to regulated suppliers and provide more timely investment incentives. As such, it is more likely to promote the s 52A(a) purpose of providing efficient incentives to invest. We reached a similar conclusion in 2010 and 2016.[58, 59]

3.63 After taking into account these factors, we consider that, on balance, our current prevailing approach provides better incentives to invest than under a trailing average approach.

Our considerations of the term of the risk-free rate

3.64 In our current approach, we estimate the risk-free rate using the yield to maturity of New Zealand Government bonds with a remaining term to maturity equal to the regulatory period. This ensures that regulated suppliers are compensated for the risk they are exposed to during the regulatory period and that regulated providers are able to have the expectation of earning a normal return in the long run.

3.65 The Oxera report commissioned by the 'Big 6' EDBs reviewed the regulatory determinations by the Commission, the AER, and the Office of Gas and Electricity Markets (**Ofgem**), and proposed that "the NZCC could consider a range of evidence on yields for government bonds with maturities between five and 20 years."[60]

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[57] This reduced risk would be taken into account when we set the allowance for debt issuance and associated costs.

[58] Commerce Commission "Input Methodologies (EDBs & GPBs) Reasons Paper" (December 2010), para H4.11-H4.12, p. 436.

[59] Commerce Commission "Input Methodologies Review Decisions. Topic paper 4: Cost of capital issues" (December 2016), p. 25. We note similar issues were also raised when we set the initial IMs for fibre under Part 6 of the Act, please see: Commerce Commission "Fibre input methodologies: Main final decisions - reasons paper" (13 October 2020), paras 6.92 to 6.119.

[60] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), pp. 11-13.

3.65.1 Oxera referred to the AER's choice of a five-year term for the risk-free rate, and the basis of this decision which is academic evidence from Dr Lally. Oxera considered that Dr Lally mis-interpreted the paper by Schmalensee (1989) to conclude that the term of the risk-free rate should match the duration of the regulatory period.[61]

3.65.2 Oxera referred to Ofgem's practical approach that selects a longer term based on:

3.65.2.1 placing some weight on the investment horizons of the investors being longer term; and

3.65.2.2 the greater level of stability of long-term bonds.

3.66 We sought advice from Dr Lally on the issues raised in the Oxera report. On Dr Lally's 'mis-interpretation' of the Schmalensee paper, Dr Lally disagrees with Oxera by explaining the academic content in Schmalensee (1989), and of his own proof.[62] Dr Lally explained that he does not rely upon Schmalensee (1989) for the proof of his proposition, but also that Schmalensee (1989) has proved a similar proposition without intending to do so: NPV=0 if the term for the allowed cost of capital matches the regulatory cycle.

3.67 On Ofgem's approach, Oxera recognise Ofgem's position that there is no clear precedent, academic or otherwise, on the term that should be used to compute the RFR. Oxera also investigated Ofgem's reasoning based on the stability of long-term bonds (as discussed in paragraph 3.65.2) and found there is no clear pattern in the volatility of yields of New Zealand government bonds with different maturities.

3.68 We consider that Lally (2023) clarified how he reached his conclusion on the term of the risk-free rate, and Oxera's claim about Dr Lally's misinterpretation of the Schmalensee paper does not discredit Dr Lally's proof. We also consider that Oxera's own finding in relation to Ofgem's reasoning does not support its own proposal to extend our current term of the risk-free rate.

3.69 After considering Oxera's reasoning for extending the term of the risk-free rate, we are not persuaded that we would better promote the purpose statement through lengthening the term of the risk-free rate.

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[61] Schmalensee "An Expository Note on Depreciation and Profitability Under Rate-of-Return Regulation" (1989) Journal of Regulatory Economics, vol. 1, pp. 293-298.

[62] Lally "Review of submissions on the risk-free rate and the cost of debt" (report to the Commerce Commission, 17 March 2023), pp. 4-6.

Our considerations of annual updating of the risk-free rate

3.70 Oxera recommended that:[63]

> the NZCC reassess its decision against annually updating the RFR estimate (ie, 'indexation'), as not doing so would leave the EDBs in New Zealand exposed to the rising interest rate risks that would materialise over a multi-year price control period.

3.71 Oxera observed that the bond yields of New Zealand government bonds have become increasingly volatile since the 2016 IM Review. Therefore, the decision not to update the risk-free rate more frequently is likely to be more problematic in future regulatory periods. Oxera considered that indexation or other measures could address the problems arising from the risk-free rate volatility.[64]

3.72 We sought advice from Dr Lally on this issue. Lally (2023) considers that it is implicit in our current approach to the cost of debt that regulated firms will (at the commencement of each five-year regulatory cycle) transform the risk-free portion of their interest payment obligations to a five-year term, and it would be rational for them to do so in order to avoid interest rate risk. Furthermore, we allow for the transaction costs of these swap contracts.[65]

3.73 While we agree with Oxera about the future possibility of increasing volatility in the risk-free rate, we consider that this volatility might be a concern only if it affects investment incentives, which is not the point made in Oxera's submission. The regulated suppliers can hedge their exposure to interest rate volatility and be granted an allowance to cover hedging costs.

3.74 We also note that our draft decision to change the revenue wash-up (see chapter 5 of Financing and Incentivising Efficient Expenditure during the Energy Transition topic paper[66]) will make annual revenue adjustments for inflation consistent with the assumption that firms will convert the interest rate component of their cost of debt to five-year debt (that is annual revenue adjustments will exclude the effect inflation has on the cost of debt).

3.75 On balance, we do not believe that annually updating the risk-free rate would better promote the purpose statement.

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63 Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), p. 11.

64 Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), pp. 15-16.

65 Lally "Review of submissions on the risk-free rate and the cost of debt" (report to the Commerce Commission, 17 March 2023), pp. 12-13.

66 Commerce Commission "Part 4 Input methodologies Review 2023 - Draft decision - Financing and incentivising efficient expenditure during the energy transition topic paper" (14 June 2023), chapter 5.

Debt premium

Our methodology

3.76 The 2016 IMs specified that, in estimating the debt premium, we will:

3.76.1 use data on bonds issued by relevant corporates with a target credit rating consistent with our notional rating for the regulated sector;

3.76.2 use a simple benchmark of New Zealand issued, New Zealand dollar denominated corporate bonds;[67]

3.76.3 use a five-year average of annual debt premium estimates;

3.76.4 use data on bonds with a five-year target term to maturity; and

3.76.5 provide a TCSD for qualifying suppliers (where a supplier's average tenor of all debt is greater than 5 years).

3.77 Our detailed steps for estimating the debt premium are set out in our WACC guidelines.[68]

3.78 Details of the TCSD, debt issuance and associated costs and credit ratings are discussed in paras 3.107 to 3.172.

Issues raised in submissions

3.79 We have received submissions in relation to the averaging period, the benchmark tenor of debt, and annual updating of debt premium. This is summarised below:

3.79.1 The Oxera report considered that there is a mismatch between the averaging periods for the risk-free rate and the debt premium, which requires correction.[69]

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[67] The IMs also prioritise the corporate bonds to be used and allow us to have reference to the NSS curve. For more details please see: Commerce Commission "Guidelines for WACC determinations under the cost of capital input methodologies" (January 2023).

[68] Commerce Commission "Guidelines for WACC determinations under the cost of capital input methodologies" (January 2023), pp. 18-26.

[69] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), p. 43.

3.79.2 The Oxera report proposed that the benchmark tenor of debt of the EDBs be raised from five years.[70] The CEG report commissioned by ENA also recommended that the benchmark tenor of debt be raised to 10 years. CEG considered that there is an inconsistency between a five-year debt tenor and the asset beta estimate which is drawn from firms with an average debt tenor of 20 years, and that this inconsistency leads to a downward bias in WACC.[71]

3.79.3 The Oxera report proposed that the trailing average debt premium be annually updated, to provide a better match to the costs incurred by the EDBs (for PQ regulation).[72]

3.80 We discuss each of the above issues in the following sections.

Our considerations of the averaging periods for the risk-free rate and debt premium

3.81 Oxera considered that:[73]

> [the Commission's] use of a prevailing RFR, which has a three-month averaging period, and the historical debt premium, which is calculated as a five-year average, leads to a mismatch in the method by which the two elements of the CoD are calculated.

3.82 Oxera recommended that:[74]

> the NZCC could adjust the tenors of the RFR and debt premium so that they match.

3.83 We sought advice from Dr Lally on this issue. Lally (2023) points out that the purposes of these averaging periods are entirely different; three months for the risk-free rate component is to provide a sufficiently wide window for regulated businesses to undertake interest rate swap contracts, while the five-year averaging period for the debt premium is in order to replicate the debt premium costs incurred by regulated firms that borrow for five-year terms with staggered maturity dates. Thus, there is no need for these averaging periods to be matched.[75]

3.84 We agree with Dr Lally that Oxera's argument is misplaced and that the different purposes of the averaging periods for the risk-free rate and the debt premium justify the different terms.

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[70] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), p. 43.

[71] CEG "Estimating the WACC under the IMs" 'Appendix C -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, February 2023)

[72] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), pp. 44-45.

[73] Ibid, p. 43.

[74] Ibid, p. 43.

[75] Lally "Review of submissions on the risk-free rate and the cost of debt" (report to the Commerce Commission, 17 March 2023), p. 13.

Our considerations of the benchmark tenor of debt

3.85 Oxera considered that: [76]

> the NZCC could reduce the risks around recovering the costs of embedded debt by considering an extension of the averaging period for the debt premium and RFR.

3.86 Oxera submitted that:[77]

> Based on data provided to Oxera by the EDBs we worked with on this report, the mean tenor of the debt that EDBs raise is 8.5 years. Thus, if the interest payments on debt issued more than five years ago are materially different to the hybrid average that the NZCC calculates, the EDBs will be either over- or under-compensated.

3.87 Oxera raise an issue that we addressed in 2016: that given suppliers may have raised debt outside of the window in which we estimate the debt premium, there may be a mismatch between the debt premium at the time debt was raised and that used in calculating the debt premium for the purposes of regulation.

3.88 In 2016 we noted:[78]

3.88.1 The debt premium is relatively stable, which reduces the chance that any mismatches will have a material impact on supplier revenues.

3.88.2 Any potential mismatches can take place in both directions. Therefore, mismatches are likely to even out over time. We consider that regulated suppliers should be able to manage this risk.

3.88.3 Dr Lally has provided evidence that any mismatches in the debt premium are likely to be at least partially offset by mismatches between our estimate of the TAMRP and its true value.[79]

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[76] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), p. 43.

[77] Ibid, p. 43.

[78] Commerce Commission "Input methodologies review decisions Topic paper 4: Cost of capital issues" (December 2016), p. 36.

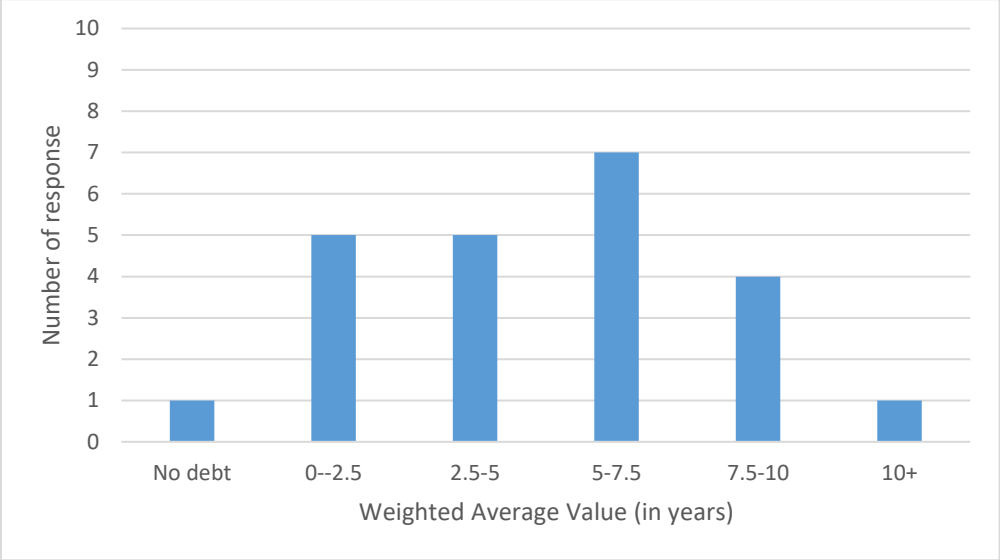
[79] See Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk and TAMRP: Lally "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p. 9.

3.89 However, we recognised that if the determination window happened to coincide with a period of abnormal market conditions, then suppliers could be over- or under-compensated in comparison to their incurred debt as they could not hedge between their incurred debt premium and the allowance provided in the WACC. We consider that significant one-off movements in the debt premium of this type could have a sufficiently large effect on revenues to suppliers and prices paid by consumers that estimating an 'average' debt premium over a longer period of time is a more appropriate solution. At that time, we considered a five-year average was an appropriate balance. In particular, whilst this change resulted in a small negative impact on investment incentives for suppliers (compared to the prevailing rate), we considered the impact of this would be limited given the generally small movements of the debt premium in normal market conditions, and a five-year average would provide protection to consumers against one-off significant changes in debt premiums.

3.90 We have received additional evidence from the confidential debt survey we conducted in 2022, where we found that some suppliers do have an average original term above five-years, but half of the suppliers do not. Many of the smaller suppliers do not issue bonds and have shorter term debt. If we were to provide a longer term for all suppliers, we would over-compensate half of the suppliers with a term of five-years and less.

3.91 Our 2022 confidential debt survey found that the value-weighted average original term to maturity of the regulated suppliers that responded was 7.25 years. Twelve of 23 regulated suppliers that responded to our request advised that the actual weighted average original period to maturity of their debt was greater than five years, and only one was greater than 10 years. For half of regulated suppliers, the weighted average original period to maturity was five years or less. The distribution of their responses is shown in Figure 3.2.

Figure 3.2 Regulated suppliers' debt portfolio: weighted average original term to maturity of interest bearing debt



3.92 We consider that a five-year term when estimating the debt premium is reasonable. Qualifying suppliers that have issued debt with an average term longer than the regulatory period (thereby incurring a greater debt premium) will not be under-compensated as they will qualify for the TCSD allowance which provides compensation for the efficient cost of longer-term debt incurred by an individual supplier. The TCSD is discussed under paras 3.107 to 3.139.

3.93 On balance we do not consider that lengthening the averaging period would better promote the purpose statement.

Our considerations of the 'inconsistency between the asset beta estimate and debt tenor'

3.94 The CEG report commissioned by ENA considered that there is an inconsistency between our use of a five-year benchmark debt tenor and our EDB asset beta estimate which is drawn from firms with an average debt tenor of 20 years. CEG considered this inconsistency leads to a downward bias in WACC because the five-year benchmark debt tenor gives rise to a lower cost of debt and the 20-year average debt tenor of energy comparator sample results in a lower equity beta.

3.95 CEG linked this problem to the 'leverage anomaly' identified by the Commission, and argued that the leverage anomaly is a direct corollary of the 'tenor anomaly'.[80, 81]

> Choosing a different leverage to the sample average should not affect the WACC but, without accounting for debt beta it does. Similarly, choosing a different tenor to the sample average should not affect the WACC but, without accounting for debt beta it does. The NZCC has addressed the leverage anomaly but the same logic means it should also address the tenor anomaly.

3.96 CEG submitted that the only reason why the equity owners of a firm would choose to issue higher cost long term debt rather than short term debt is that doing so reduces the cost of equity. CEG further submitted that this must manifest through a lower equity beta because longer term debt absorbs some of 'equity-like' risk which raises the 'debt beta' for the debt instrument.[82]

3.97 CEG considered that we need to address the 'debt tenor anomaly' by adopting an average debt tenor consistent with the average debt tenor in the asset beta sample.[83]

3.98 We sought advice from Dr Lally on this issue. Lally (2023) notes that the issues on asset beta and debt tenor are quite distinct in regard to notional leverage, and the merits of the leverage/asset beta argument have no apparent relevance to the debt tenor/asset beta issue.[84]

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[80] Commerce Commission "Input Methodologies (electricity distribution and gas pipeline services) Reasons Paper" (December 2010): "When the simplified Brennan-Lally CAPM is used to estimate the cost of equity (in conjunction with the simplified beta leveraging formula, i.e. debt beta is assumed to be zero), and the estimated cost of debt includes a positive debt premium, the resulting estimate of WACC increases as leverage increases. The higher the value for the debt premium incorporated in the estimated cost of debt, the greater the effect on the resulting estimate of WACC as leverage increases. This anomaly is being created by the analytical models used to estimate the WACC rather than simply reflecting unusual market conditions."

[81] CEG "Estimating the WACC under the IMs" 'Appendix C -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, February 2023), p. 5.

[82] CEG use the formula $Equity\ beta = \frac{\text{Asset beta} - \text{Debt beta}}{1 - \text{Leverage}}$ to show that an increase in debt beta reduces equity beta. Ibid, p. 4.

[83] Ibid, pp. 1, 3-8.

[84] Lally "Review of submissions on the risk-free rate and the cost of debt" (report to the Commerce Commission, 17 March 2023), pp. 19-20.

3.99 We agree with Dr Lally that CEG has not established the equivalence between the 'leverage anomaly' and the 'debt tenor anomaly'. There is a mathematical proof of the 'leverage anomaly' which is the basis of our use of notional leverage, whereas the relationship between the debt tenor and debt beta is an empirical question and CEG has not provided evidence to support their claim that issuing longer term debt reduces debt beta.

3.100 Without the link between the 'leverage anomaly' and 'debt tenor anomaly' claimed by CEG, the choice of comparator firms for the estimation of a benchmark asset beta for EDBs and the choice of a benchmark efficient debt tenor are distinct matters. We provide detailed reasoning for our draft decisions on these two matters in other sections.

Our considerations of an annual update of the debt premium allowance

3.101 Oxera observed that there is substantial volatility in the debt premium since the 2016 IM Review which implies a material difference between the debt premium allowance and actual costs incurred by the EDBs. Oxera proposed that we index the debt premium allowance (for PQ path WACC determinations) to help reduce the networks' exposure to the high level of movement in market rates.[85]

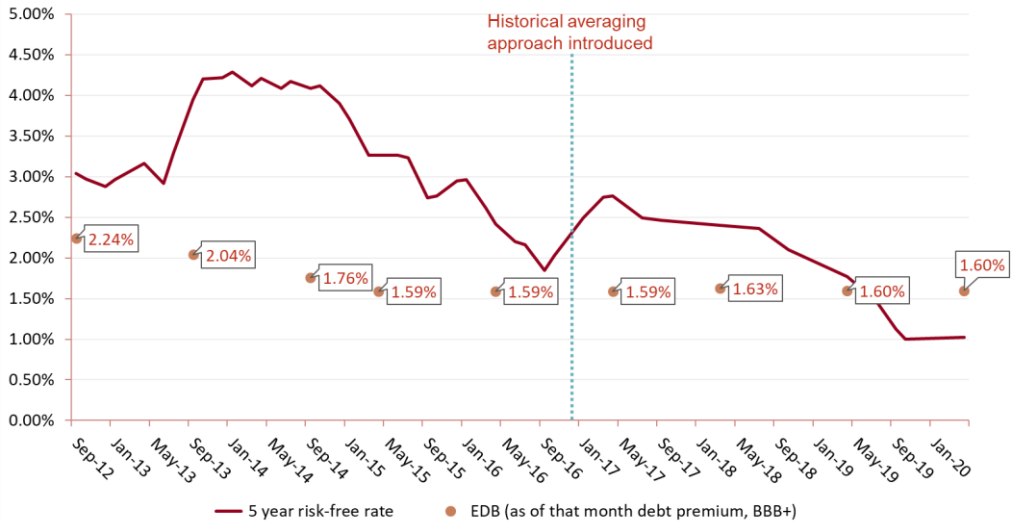
3.102 We sought advice from Dr Lally on this issue. Lally (2023) showed that his empirical analysis with regard to annually updating the trailing average debt premium supports Oxera's claim, but that the gain is very small and annual updating incurs additional administrative costs. [86]

[85] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), pp. 44-45.

[86] Lally "Review of submissions on the risk-free rate and the cost of debt" (report to the Commerce Commission, 17 March 2023), pp. 13-19.

3.103 In the 2020 Fibre IMs, we also looked at how the debt premium has changed over time, and its potential impact.[87] Figure 3.3 below demonstrates that the debt premium (averaged over five years) has been relatively stable over time. We note that the five-year average debt premium would have less volatility compared with annual numbers (the latest EDBs' annual debt premiums are 1.55% (2021), 1.15% (2022), and 1.25% (2023) which when averaged are 1.59% (2021)[88], 1.51% (2022)[89], and 1.43% (2023) [90]), especially after the historical averaging approach was introduced during the 2016 IM Review.

Figure 3.3 EDB historical debt premium estimates



3.104 We consider that any change in the average debt premium from a given year to another will generally be relatively small given they are averaged over five annual estimates. The debt premium for investment grade bonds has generally been relatively stable, so changes in debt premium will likely not be biased up or down over a long time period and errors are therefore likely to cancel out, on average, over time. Therefore, we do not consider that over time our method will detract from the Part 4 purpose by compromising the NPV=0 principle.

87 Commerce Commission " Fibre input methodologies: Main final decisions – reasons paper" (October 2020).

88 Commerce Commission "Cost of capital determination for disclosure year 2022 for information disclosure regulation. Electricity distribution businesses and Wellington International Airport." (April 2021), p. 5.

89 Commerce Commission "Cost of capital determination for disclosure year 2023 for information disclosure regulation. Electricity distribution businesses and Wellington International Airport." (May 2022), p. 5.

90 Commerce Commission "Cost of capital determination for disclosure year 2024 for information disclosure regulation. Electricity distribution businesses and Wellington International Airport" (May 2023), p. 5.

3.105 We recognize that, in theory, annual updating of the debt premium would be more aligned with the opportunity cost of investment at a given point of time. However, we find that the impact on suppliers would be small which does not justify the compliance costs and additional complexity associated with updating the debt premium annually.

3.105.1 Recalculating and reapplying the WACC annually during a regulatory period would involve intervening in the price-path and resetting allowed revenue for each year of the regulatory period. This would introduce uncertainty to both suppliers and consumers.

3.105.2 We considered an alternative mechanism in the 2020 Fibre IMs - an NPV-neutral debt premium wash-up at the end of the regulatory period which would be less administratively burdensome and less complex than updating the price-path each year. However, we found the net effect of the wash-up on the supplier's revenue would be insignificant. For example, based on the annual variations in the debt premium from 2016 to 2020 (in Figure 3.3), if we were to implement the debt premium wash-up approach, the net change in the debt premium would be an increase from 1.59% (in 2016) to 1.60% (in 2020). The resulting net wash-up to the supplier would be 0.3 bps.[91]

3.106 In summary, we consider that the gains from updating the debt premium throughout the period and implementing an NPV-neutral wash-up are marginal (and will in any event be reflected in the averaging period in the future), and do not justify the effort and additional complexity of introducing an adjustment.

Term Credit Spread Differential

3.107 The cost of capital IM includes a TCSD allowance to compensate suppliers for the additional debt premium incurred from issuing debt with an average original term greater than five-years (the term that we allow for in the debt premium).

3.108 Although the TCSD is conceptually a component of the cost of capital, it is treated as an adjustment to cash-flows and is only available to suppliers who have met the criteria and issued long-term debt. We recognise that issuing longer term debt can be consistent with prudent debt management.

Our methodology

3.109 The TCSD is calculated by way of a formula that combines:

[91] For detail about this example, please see Commerce Commission " Fibre input methodologies: Main final decisions – reasons paper" (October 2020), pp. 378-379.

3.109.1 the additional debt premium associated with debt that has an original term to maturity in excess of the five-year debt premium (the 'spread premium'),[92] and

3.109.2 a negative adjustment to take account of the lower per-annum debt issuance costs that are associated with longer-term debt.[93] This is tied to the value of debt issuance and associated costs (discussed later in this chapter).

Issues raised in submissions

3.110 We have received submissions from energy businesses and airports on the TCSD.

3.111 The ENA recommends that, if we continue to adopt a five-year tenor for the debt premium, a spread premium of 9.1 bps be used.[94]

3.112 New Zealand Airport Association (**NZAA**) and Wellington International Airport (**WIAL**) suggested a change to the IMs to allow for the benchmark tenor of debt to reflect an airport's actual tenor.

3.113 We consider these issues later in this section after discussing how we reached our draft decision on the TCSD for energy businesses and airports.

TCSD for EDBs/Transpower and GPBs

3.114 Our draft decision is to maintain a spread premium of 7.5 bps for energy businesses. The following section explains how we reach this draft decision, including how we determine the value for each element in the TCSD formula.

Spread premium

3.115 The spread premium is the additional debt premium that has an original term to maturity in excess of the five-year tenor we allow for in the debt premium.

3.116 We have based our approach to estimating the spread premium on our 2016 approach.[95] Our detailed approach is described as follows.

Time period

[92] This debt is called 'qualifying' debt.

[93] We assume that all debt issuance costs are fixed, irrespective of the original term of the debt.

[94] Electricity Networks Association (ENA) - Rate of return issues -"Submission on IM Review CEPA report on cost of capital" (3 February 2023); CEG "Estimating the WACC under the IMs" 'Appendix C -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, February 2023).

[95] Commerce Commission "Input methodologies review decisions: Topic paper 4 – Cost of capital issues" (20 December 2016), attachment E.

3.117 We have included the last seven years' worth of data (from 1 September 2015 to 31 August 2022) in our sample, broken into 14 semi-annual periods.

Samples

3.118 Our analysis is based on our proposed benchmark credit rating – BBB+ for energy businesses. However, we consider that including bonds for BBB and A- credit ratings in the analysis can allow for a larger, more robust sample. We include dummy variables for these additional credit ratings (BBB, A-) to take account of the average difference from the target credit rating (BBB+). We refer to the sample with BBB, BBB+, and A- bonds as a 'full sample' in the following paragraphs.

3.119 We also split the sample based on whether we include or exclude bonds that are issued by entities that are 100% government or local authority owned. Bond yields of these entities are less likely to be consistent with privately owned companies (and that of a 'benchmark supplier'), given the existence of an implicit guarantee from the government in the event of financial distress.

3.120 Therefore, we have included four subsamples in our analysis, including:

3.120.1 BBB+ only sample including 100% government-owned bonds;

3.120.2 BBB+ only sample excluding 100% government-owned bonds;

3.120.3 Full sample including 100% government-owned bonds; and

3.120.4 Full sample excluding 100% government-owned bonds.

3.121 We note that some issuers' credit ratings have changed over time. For simplicity, we use the credit rating as at the beginning of each semi-annual period.[96]

Method

3.122 We use the following three steps in estimating the spread premium using an econometric approach:

[96] For example, the credit rating for Wellington International Airport has changed over time (BBB+ from 2006 to 14th June 2020, and BBB from 15th June 2020). We have used the credit rating as at the beginning of each semi-annual period.

3.122.1 A key assumption required to estimate the spread premium is to obtain an estimate of the five-year debt premium, so that the 'spread premium' above the five-year term can be estimated. Therefore, the first step is to estimate the five-year debt premium for each individual month in the sample using the NSS curve.[97]

3.122.2 Next, we calculate the 'adjusted debt premium' by subtracting the five-year debt premium from the observed debt premium (which will have a tenor above five years). This gives the additional debt premium for each bond and a remaining term relative to the five-year baseline.

3.122.3 Finally, we estimate a constant linear relationship between the remaining term above five years and the adjusted debt premium and set the intercept of the linear slope to zero. The resulting slope is the spread premium. This estimates the expected additional costs to regulated suppliers of each additional year of term to maturity associated with a bond with a term longer than five years.

3.123 We have used the NSS method as a cross-check against the econometric approach described above. We have undertaken analysis based on semi-annual NSS curves using the same semi-annual periods as the econometric approach. We have used a sample including bonds with the target credit rating (BBB+) and included bonds from one tier each side of the target rating (ie, BBB and A-) to increase the sample size and robustness of the analysis.[98]

3.124 Our spread premium results are summarised below in Table 3.1.

[97] The NSS framework allows for a yield curve with the 'humped' shape often associated with bond-yield term structures. For a detailed explanation of NSS curve, see Commerce Commission "Input methodologies review decisions: Topic paper 4 – Cost of capital issues" (20 December 2016), attachment H.

[98] As with the econometric approach outlined above, the NSS approach adjusts for the average difference between the credit ratings for each bond and the target credit rating.

Table 3.1 Summary of spread premium estimates

	Spread premium of last 7 years (in bps)	Spread premium of last 7 years (excluding March – August 2020) (in bps)
BBB+ only including 100% govt owned bonds	11.6	8.7
BBB+ only excluding 100% govt owned bonds	11.0	8.1
Full sample including 100% govt owned bonds	10.2	8.0
Full sample excluding 100% govt owned bonds	3.8	6.8
NSS method	8.7	8.2

3.125 We consider that we should place the greatest weight on full samples both including and excluding 100% government owned bonds as they are based on the largest sample. We also consider that it is more appropriate to exclude the COVID-19-affected period (March 2020 – August 2020) due to the large outliers and abnormal observations.

3.126 Given the variation in the results, we consider an approximate judgement is more appropriate than a value from a specific dataset.

3.127 The average spread premium result based on our preferred subsamples and time periods is 7.4 bps which is very close to our current spread premium of 7.5 bps. Therefore, we propose to maintain the spread premium of 7.5 bps.

Debt issuance cost adjustment

3.128 In addition to the spread premium incurred from issuing debt with longer maturity dates, the TCSD takes into account the reduced per annum issuance costs associated with longer-term debt.

3.129 Our estimate of the debt issuance and associated costs is fixed (based on the length of the regulatory period). Therefore, regardless of the debt term, the required adjustment can be calculated based on our allowance of 0.20% p.a. issuance costs for debt with a five-year original term.[99] Table 3.2 provides the lower debt issuance costs associated with debt that has a longer original tenor and also how this translates to a debt issuance cost adjustment as part of the TCSD calculation.

[99] See paragraphs 3.141 for detailed explanation on debt issuance and associated costs.

Table 3.2 Debt issuance costs adjustment

Tenor	5	6	7	8	9	10
Issuance costs (0.20%*5/tenor)	0.20%	0.17%	0.14%	0.13%	0.11%	0.10%
Debt issuance cost adjustment	0.00%	-0.03%	-0.06%	-0.07%	-0.09%	-0.10%

TCSD

3.130 For combining the spread premium and the debt issuance costs adjustment, a fixed relationship between the original tenor of issued debt and the TCSD can be determined.

Table 3.3 TCSD for different original tenor length (EDBs/Transpower and GPBs)

Tenor	5	6	7	8	9	10
Spread premium	0.000%	0.075%	0.150%	0.225%	0.300%	0.375%
Debt issuance cost adjustment	0.00%	-0.03%	-0.06%	-0.07%	-0.09%	-0.10%
TCSD	0.00%	0.05%	0.09%	0.16%	0.21%	0.28%

3.131 To incorporate the TCSD formula for energy businesses in the IMs, we propose to maintain the current approach. That is to:

3.131.1 provide a formula in which the input would be the original tenor of the relevant debt issuance – this input would not need to be rounded;

3.131.2 use the formula to calculate the TCSD for each bond by determining the relevant spread premium and debt issuance costs adjustment; and

3.131.3 set the maximum tenor allowed in the calculation to be 10 years.

Our considerations of submissions on TCSD for energy

3.132 The CEG report commissioned by ENA suggests a spread premium of 9.1 bps rather than the TCSD spread premium in the current IMs of 7.5 bps.[100] In summarising the CEG report, the ENA write that:[101]

[100] CEG "Estimating the WACC under the IMs" 'Appendix C -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, February 2023).

[101] Electricity Networks Association (ENA) - Rate of return issues -"Submission on IM Review CEPA report on cost of capital" (3 February 2023).

ENA's view is that CEG's analysis supports the Commission's decision to adopt a six-monthly estimation period in preference to a monthly estimation period. This approach result in a TCSD of 0.091%.

ENA recommends that if the Commission continues to adopt a 5-year debt tenor, a TCSD of 0.091% be used.

3.133 CEG's estimates of the spread premium are consistently higher than ours. CEG have provided us with their detailed calculations, however we have not yet been able to reconcile their results with ours. Based solely on their report, we note that:

3.133.1 CEG has used a slightly different method to us for estimating the spread premium. For example: we have estimated the five-year debt premium for each individual month while CEG has estimated it only for each semi-annual period. This difference between the methods will lead to different estimates of the spread premium.

3.133.2 We are not sure which subsample CEG are using when estimating the spread premium. CEG appear to use the BBB+ only excluding 100% government-owned bonds sample. However, we note that CEG also included the bonds issued by Christchurch Airport which is 100% owned by Christchurch City Council and the New Zealand government.[102, 103]

3.134 Our draft decision is to maintain the current TCSD allowances for EDBs, GPBs and Transpower. We are releasing the spreadsheet of our calculations and hope to clarify the reasons for the differences between our estimates of the spread premium and CEG's to inform our final decision.

TCSD for airports

3.135 Our draft decision is to maintain our 2016 decision of not specifying a TCSD value for airports in the IMs.

3.136 Airports are subject to ID regulation, and the impact of longer-term debt can be considered at the PSE depending on the Airport's specific circumstances.

[102] CEG "Estimating the WACC under the IMs" 'Appendix C -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, February 2023), para 74.

[103] CEG also note that our August 2022 WACC determination did not include some longer maturity bonds that would be relevant for the TCSD calculation. We agree that all of the bonds that meet our criteria are relevant, and we have used these in our updated estimation of the spread premium. The bonds used in the WACC determination (for the purposes of estimating the debt premium) are not necessarily relevant for estimating the spread premium.

Our considerations of submissions on TCSD for airports

3.137 NZAA support the decision of not including a TCSD for airports:[104]

> Originally, the IMs included a TCSD to compensate airports that issue debt with an average initial tenor of more than five years (albeit it resulted in a cashflow adjustment rather than a change to WACC). It was removed in the 2016 IM Review due to is complexity and lack of effectiveness. NZ Airports does not advocate for a return of the TCSD.

but would like us to consider that:

> it should be possible for airports to use a debt premium in their pricing WACC that is different to the benchmark in the WACC IM, if that better reflects their actual debt tenor.

3.138 Wellington International Airport Limited (WIAL) also suggested a change to the IMs to allow for debt tenor to reflect an airport's actual tenor.[105]

3.139 We consider that the compensation for long-term debt can be assessed during the PSE. For example, we assessed whether additional compensation would be appropriate for the additional debt premium that can be incurred from issuing debt with a longer original term than the five-year regulatory period for Wellington Airport in our 2022 PSE review.[106]

Compensation for debt issuance and associated costs

3.140 Firms incur costs when raising and managing their debt. These costs are not reflected in the debt premium but are an inherent cost of raising the debt finance needed to support an ongoing business. The IMs recognise that fees and costs associated with prudent debt issuance and refinancing costs are legitimate expenses that should be compensated for. The current IMs provide a total allowance for debt issuance and associated costs of 20 bps p.a.

Rationale for our draft decision

3.141 Our draft decision is to maintain a total allowance of 20 bps p.a. for a five-year regulatory period and allow an upward adjustment for a four-year regulatory period. We consider that debt issuance costs would be relatively higher for a four-year regulatory period as a proportion of total annual debt costs, as the fixed issuance costs would be spread over a shorter time period, and that the 20 bps should therefore be scaled up on a pro rata basis.[107]

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[104] NZ Airports Association Inc. "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022).

[105] Wellington International Airport Limited "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022).

[106] Commerce Commission "Review of Wellington Airport's 2019-2024 Price setting event: Final report" (28 September 2022), pp. 86-90.

[107] The allowance for a four-year regulatory period is 25 bps (estimated as 25bps = 20*(5/4)).

3.142 Given the variability in individual costs, we have deliberately not been precise in estimating the individual components of debt issuance costs, but the baseline 20 bps for a five-year regulatory period broadly represents:

3.142.1 direct debt issuance costs – 8-10 bps p.a.;

3.142.2 swap costs – 4 bps p.a.; and

3.142.3 compensation for potential additional costs, where efficiently incurred, associated with costs such as brokerage, new issue premium, committed facilities/cost of carry or forward starting swaps – 7-9 bps p.a.

3.143 We consider that the 20 bps p.a. estimate for a five-year regulatory period is our best view of the average cost of a benchmark supplier that issues New Zealand domestic vanilla bonds on a regular basis consistent with our 'simple approach' to estimating the cost of debt. Further details on how we reached the conclusions on debt issuance and associated costs are provided in the following sections.

How we reached the estimated debt issuance and associated costs

Direct debt issuance cost

3.144 Direct issuance costs are the costs incurred to raise new debt. These can include one-off and ongoing costs required to issue debt in New Zealand in line with our simple approach to setting the cost of debt.

3.145 To help review the suitability of our current estimate of debt issuance costs, we have considered the information provided in the confidential debt survey. From this survey we identified 38 vanilla New Zealand domestic bonds issued by seven regulated suppliers that are equivalent to the type of bond from which we estimate the debt premium. The average direct debt issuance cost provided in the debt survey of these bonds was 9.2 bps p.a. when averaged over the original tenor of the bond, with a median of 6.9 bps p.a.

3.146 For the 38 vanilla New Zealand domestic bonds, 58% had a direct issuance cost less than 8 bps p.a., while 71% had a direct issuance cost less than 10 bps p.a. Therefore, we consider a direct debt issuance cost of 8-10 bps p.a. is a reasonable allowance.

Swap costs

3.147 Consistent with our assumed debt management strategy, we assume that suppliers will use interest rate swaps to match the term of the regulatory period using fixed-to-floating interest rate swaps:

3.147.1 swapping fixed (with a term above five years) rate for a base floating rate at the time of issuance;

3.147.2 swapping the base floating rate at the time of the regulatory reset determination window for five-year fixed rate.

3.148 We defined the cost of executing a swap transaction as:[108]

> half of the New Zealand dollar wholesale bid and offer spread for a vanilla interest rate swap determined at the time of pricing the qualifying debt.

3.149 We have relied on the confidential debt survey for the cost of executing an interest rate swap. The results from the debt survey on interest rate swap costs supports our proposed allowance of 2 bps per swap. Based on the incentivised debt management strategy, we allow suppliers the cost of two fixed-floating interest rate swaps per year.[109] Therefore, we consider that the allowance of 4 bps p.a. is reasonable.

Compensation for 'potential' additional cost

3.150 We recognise that not all costs are captured by the direct issuance and swap costs. There are other potential indirect and other costs associated with maintaining an efficient debt portfolio.

3.151 In 2016 we allowed for potential costs, where efficiently incurred, associated with brokerage, new issue premium, committed facilities/cost of carry, forward starting swaps of 7-9 bps p.a.

3.152 As we received no new information around other potential debt raising costs, we propose to maintain the current allowance of 7-9 bps. We welcome more evidence on these costs in submissions.

Stakeholder submissions on debt issuance and associated costs

3.153 We did not receive any submissions suggesting that our approach to determining the level of direct issuance costs, swap costs and potential other costs in the current IMs is not appropriate.

Amortisation of debt issuance costs

[108] Commerce Commission "Input methodologies review decisions: Topic paper 4 – Cost of capital issues" (20 December 2016).

[109] We incentivise regulated suppliers to swap the fixed rate for a base floating rate at the time of issuance, and then swap the base floating rate for the five-year fixed rate at the time of the WACC determination window.

3.154 The CEG report commissioned by ENA suggest that we should include a NPV adjustment to debt issuance cost to address the amortisation of debt issuance costs for debt raised in previous years.[110] In summarising the CEG report, the ENA write that:[111]

CEG has identified a potential error (Appendix B) in the Commission's collation of debt issuance cost in its final 2016 decision, which understated transaction costs by around 0.5bp (assuming a 5-year tenor and a 5% discount rate). This mathematical error should be simple to correct.

…

In the regulatory context, we can think of the entire debt RAB as the inventory of debt that is being used up (maturing) and replenished (refinanced) at a rate of 20% per year. The Commission's approach to compensate only for the costs of new debt as it is incurred amounts to, in effect, refusing to compensate for the costs of prior building and holding of that debt inventory.

Our considerations of submissions

3.155 We consider that the current level of debt issuance costs appropriately provide for the cost of maintaining the notional benchmark portfolio.

3.156 In response to the CEG report on amortisation of debt issuance costs, we do not consider that this additional compensation is required because:

3.156.1 Our assumed debt management strategy is that a notional supplier raises debt consistently and on a rolling basis. Therefore, the supplier is compensated for this every year through the debt issuance costs that we allow in the WACC. The supplier can then use interest-rate swaps to fix the risk-free rate portion of existing debt but still issue new debt consistently to manage refinancing risk. Suppliers can respond to our assumed strategy to avoid mismatches with our allowed cost of debt.

3.156.2 We do not prescribe specific costs or timing of our debt issuance costs or the cost of debt allowance more generally, we simply provide an allowance based on our assumed debt management strategy and suppliers can respond to this how they like.

[110] CEG "Estimating the WACC under the IMs" 'Appendix C -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, February 2023).

[111] Electricity Networks Association (ENA) - Rate of return issues -"Submission on IM Review CEPA report on cost of capital" (3 February 2023).

3.156.3 Even if a supplier was to raise a large amount of debt at one time (which is where this amortisation cost may arise), we provide an additional allowance for other 'potential' costs associated with raising debt, in addition to direct issuance and swap costs, which could cover a range of different costs that suppliers may or may not require. This overall allowance can compensate for a range of different debt management strategies and other costs that may be required.

3.157 On this basis, we do not consider that a NPV adjustment to debt issuance and associated costs is necessary.

3.158 Given the uncertainty of the debt issuance costs, we do not consider we should be too precise in trying to replicate costs using a bottom-up approach. Instead, we consider that on the basis of the available evidence, the allowance for debt issuance costs should be no higher than 20 bps p.a. for debt with a five-year term.

3.159 We consider this is sufficient to cover the direct costs of issuing New Zealand domestic corporate bonds (8-10 bps) and costs of any required interest-rate swaps (4 bps). As noted above, given the uncertainty and variability of the various costs, we consider it is prudent to include an additional allowance to cover other issues related to debt issuance.

3.160 Therefore, we are satisfied suppliers are adequately compensated for their debt issuance costs.

Credit rating

Rationale for maintaining our 2016 IMs decision on credit rating

3.161 Credit ratings are an indication of a borrower's creditworthiness. The higher the rating, the less the likelihood of default.

3.162 In the 2016 IM Review, we specified notional long-term credit ratings, which are used when estimating the debt premium. We consider that if suppliers' actual credit ratings were used there may be an incentive for them to increase leverage, leading to adverse implications for consumers.

3.163 We consider that an efficient operator would seek to maintain an appropriate investment grade credit rating to ensure satisfactory access to debt capital markets at reasonable costs. S&P minimum long-term credit rating considered to be investment grade is BBB-.

3.164 Under the current IMs, we use an S&P long-term credit ratings of BBB+ for EDBs, Transpower, and GPBs and A- for airports because this provides an adequate safety margin above the minimum investment grade.[112] This margin protects against the possibility that economic downturns or shocks can lead to financial distress, but also provides suppliers with flexibility over the level of leverage and the choice of debt instruments.

3.165 We consider that our current S&P long-term credit ratings for energy businesses and airports remain appropriate, given that:

3.165.1 BBB+ is the most common long-term credit rating of the companies in our comparator sample for EDBs, Transpower, and GPBs; and

3.165.2 there are only three businesses in the airports comparator sample with credit ratings (ranged from A- to A+).

3.166 Therefore, we propose to maintain the current S&P (or equivalent from other recognised agency) long-term credit ratings of:

3.166.1 BBB+ for EDBs/Transpower, and GPBs; and

3.166.2 A- for airports.

Stakeholder submissions on credit rating for energy businesses

3.167 Submissions from energy businesses such as ENA and Powerco support our use of the notional credit rating of BBB+ for EDBs and GPBs in the CEPA consultation submissions.[113]

Stakeholder submissions on credit rating for specified airport services

3.168 TDB Advisory for the Board of Airline Representatives New Zealand Inc. (**BARNZ**) support our use of notional credit ratings for airports remaining at A- in both the Process and issues paper[114] and CEPA consultation submissions:[115]

We suggest that the notional long-term credit rating for airports remain at A-. This would provide continuity and consistency with the Commission's past approach to this issue. We note that there have been several

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[112] Commerce Commission "Input methodologies review decisions: Topic paper 4 – Cost of capital issues" (20 December 2016), para 250.

[113] Electricity Networks Association (ENA) - Rate of return issues -"Submission on IM Review CEPA report on cost of capital" (3 February 2023); Powerco "Submission on IM Review CEPA report on cost of capital" (3 February 2023).

[114] Board of Airline Representatives New Zealand Inc. "Process and Issues and draft Framework papers" (11 July 2022).

[115] Board of Airline Representatives NZ (BARNZ) – Cover letter – "Submission on IM Review CEPA report on cost of capital" (3 February 2023).

adjustments up and down in actual credit ratings over recent years – including Christchurch Airport moving to and then from an A- rating – with recent downgrades probably reflecting the impact of the Covid pandemic.

Overall, considering a largely post-pandemic outlook where prospects for airline and airport activities appear to be rapidly improving, we think that there is more upside than downside risk regarding credit-rating adjustments in the coming years.

3.169 WIAL submitted that we should examine whether the notional A- credit rating remains appropriate.[116]

3.170 NZAA prefer the notional credit rating approach but would like us to give some weight to the actual credit ratings of the regulated airports:[117]

The average movement in credit ratings for Wellington and Christchurch Airports has been downward, which suggests that any change to the benchmark rating would also be downward.

We also note that, as part of 2016 IM Review, the Commission observed that Bloomberg only reported long-term credit ratings for three of the airports in the comparator sample, which suggests that the comparator sample approach is not feasible for airports.

Our considerations of airports submissions

3.171 We consider that the notional long-term credit rating should reflect a prudent long-term level of exposure to credit default risk. Specifically, the notional long-term credit rating should be, and remain, comfortably within an 'investment grade' credit rating as defined by the major credit rating agencies, and a S&P long-term credit rating of A- provides an adequate margin of safety with respect to airport services. We also note that the average leverage of the airports' comparator sample, at 26%, is relatively low compared to other sectors, such as energy network businesses, at 41%.

3.172 We note that two of the three regulated airports in New Zealand have credit ratings lower than the benchmark credit rating of A-. The specific circumstances of individual airports are something that can be taken into account when reviewing price setting events and alternative credit ratings can be used, where justified. We note that we have accepted the use of a BBB+ credit rating in our 2022 price setting event review for Wellington Airport, partly as an allowance for their issuing long term debt.[118]

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[116] Wellington International Airport Limited "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022).

[117] NZ Airports Association Inc. "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022).

[118] Commerce Commission "Review of Wellington Airport's 2019-2024 Price setting event: Final report" (28 September 2022).

Chapter 4 Cost of equity

Purpose and structure of this chapter

Purpose of this chapter

4.1 The purpose of this chapter is to explain our draft decisions on:

4.1.1 the main issues raised in relation to the cost of equity, including any changes we propose to make as a result; and

4.1.2 our review of each of the parameters that make up the cost of equity, including any changes we propose to make as a result.

Structure of this chapter

4.2 This chapter begins by explaining our draft decision on the risk-free rate for the cost of equity.

4.3 We then explain our draft findings in respect of the equity beta, including:

4.3.1 how we estimated the equity beta for EDBs, GPBs, Transpower and airports using a similar approach to 2010 and updated data; and

4.3.2 whether we propose to make any adjustments to the equity beta for regulatory differences or differences in exposure to systematic risks.

4.4 We then explain our draft findings in respect of our review of TAMRP.

4.5 The discussion of risk-free rate and TAMRP applies to all regulated sectors. The asset beta section first discusses asset beta as it relates to airports, and then as it relates to EDBs, GPBs, and Transpower.

Risk-free rate for the cost of equity

4.6 Our draft decision is to use the same risk-free rate for the cost of equity and the cost of debt. Doing so would be consistent with the 2010 cost of capital IMs and 2016 review of the IMs.

4.7 Oxera (for the 'Big 6' EDBs) submitted that we "consider a range of evidence on yields for government bonds with maturities between five and 20 years" and that we assess "the feasibility of using both the government bonds and the highest-quality non-government bonds as inputs to its RFR estimation in order to take into account a possible convenience premium." [119]

[119] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), p. 11.

4.8 Oxera make three points concerning the term of the risk-free rate for equity:[120]

4.8.1 Oxera interpret a submission by Professor Schmalensee to the AER's recent RORI process as meaning that Dr Lally's argument for recommending that the term of the risk-free rate be set equal to the regulatory period is invalid.

4.8.2 Oxera notes Ofgem uses a longer term for the risk-free rate because it more closely matches the term used by investment analysts.

4.8.3 Oxera also notes Ofgem uses a longer term for the risk-free rate because the volatility of returns on inflation-linked gilts is lower than the volatility of the returns on shorter dated bonds.

4.9 We commissioned Dr Lally to comment on the points raised by Oxera. That advice is published alongside this paper.

4.10 The AER advice from Prof Schmalensee does not address the substance of the advice from Dr Lally. To the extent that the two experts disagree it is related to the authorship of the original idea.[121] The substance of the points raised by Oxera with respect to this debate are discussed in paragraphs 3.66 to 3.69.

4.11 We considered the question of using a term for the risk-free rate that more closely matches investment valuation practises in our 2016 review of the IMs.

4.12 We reaffirm the reasoning that we expressed at that review. Using a five-year term for the risk-free rate for debt and equity ensures consistency in the way in which debt and equity are estimated and that the overall cost of capital is consistent with the regulatory period to which it is to be applied. We also noted that:

[120] In their report Oxera raise issues relating to the risk-free rate for debt and equity. Some of these issues were also discussed in chapter 3. The discussion here considers Oxera's arguments solely with respect to the risk-free rate for equity.

[121] In the introduction to his statement to the AER, Professor Schmalensee sets out the two questions that he was asked to answer. Neither question was concerned with the substance an argument made by Dr Lally. Richard Schmalensee "Statement of Richard Schmalensee, Ph.D. To the Australian Energy Regulator" (29 July 2022), p.1.

4.12.1 Estimates of the risk-free rate used for expert valuations are used in a different context to WACC estimates, where prices are reset every five years. We have previously explained the reasons why the term of the risk-free rate should match the term of the regulatory period.[122] In the IMs merits appeals judgment, the High Court agreed with the principle that "…the term of the risk-free rate should be aligned to the regulatory term to avoid over and under compensation." [123]

4.12.2 A number of suppliers, with the power to set prices as they see fit and which set their own cost of capital when pricing their services, adopt a term of the risk-free rate of five years (the same as the pricing period). [124]

4.13 Having consideration for the arguments that Ofgem has made for using bonds with longer time to maturity to estimate the risk-free rate, Oxera estimate the volatility of returns on New Zealand government bonds of different maturities. Their results suggest that New Zealand government bonds with longer maturities are not less volatile than New Zealand government bonds with shorter maturities. The evidence Oxera present does not support a change to our current approach.

4.14 On the question of convenience yields and including corporate bonds in our estimate of the risk-free rate, we have previously used government bonds as a proxy for the risk-free rate of return. Oxera suggest that we use a mixture of highly rated corporate and government bonds. Oxera cite academic support for the idea of a 'convenience yield' and the precedent of the Competition & Markets Authority (**CMA**) accepting arguments that "the government can borrow at rates significantly lower than would be accessible by even the highest-rated private investor."[125]

4.15 We disagree:

4.15.1 we are not aware of any practitioners in New Zealand that use bonds other than government bonds to estimate the risk-free rate;

4.15.2 it would not always be possible to find sufficiently liquid corporate bonds with the required credit rating to use to estimate the risk-free rate; and

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[122] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H4.29-H4.59.

[123] Wellington Airport & others v Commerce Commission [2013] NZHC 3289, para 1287.

[124] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H4.51; and Commerce Commission "Input methodologies (Airport Services) reasons paper" (22 December 2010), para E4.50.

[125] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), p.12.

4.15.3 our concerns are also shared by Dr Lally, who has surveyed the academic articles cited by Oxera and concluded that they do not offer support for what Oxera is proposing.

4.16 As a further practical point, the papers that Oxera cite disagree on how the 'true' risk-free rate should be identified. Specifically, if the return on government bonds is below the true risk-free rate (because government bonds are held for reasons other than their yield) then we would need a basis for estimating the true risk-free rate in order to calculate a convenience yield. The AER acknowledged this problem, writing that: "(A)ny convenience yield is very difficult to estimate. The estimate of a convenience yield is only as accurate and robust as the proxy for the alternative and 'true' risk-free rate."

4.17 As Oxera acknowledge, the AER and Ofgem have both considered the use of bonds other than the government bonds as a proxy for the risk-free rate and have chosen to continue using only government bonds.

4.18 The AER points to the literature on convenience yields being far from settled, while Ofgem argue that the overwhelming weight of academic evidence favours the use of government bonds as the risk-free asset.

4.19 We agree with Ofgem's conclusion that: "(H)aving considered the alternatives, we could not confirm a necessarily better estimation method. Relying on ILGs [government bonds] alone is simpler, more principled, and supported by greater precedent, than other methods or combinations of methods." [126]

Equity beta

4.20 This section discusses our approach to reviewing our equity beta estimates for EDBs, Transpower, GPBs, and airports. Based on the analysis we have undertaken, we propose the following equity betas:

4.21 0.59 for EDBs and Transpower, which compares to 0.60 in the current IMs;

4.22 0.68 for GPBs, which compares to 0.69 in the current IMs; and

4.23 0.74 for airports, which compares to 0.74 in the current IMs.

Background

[126] Ofgem "RIIO-2 Final Determinations – Finance Annex (REVISED)" (03 February 2021), para 3.23.

4.24 The IMs specify the equity betas, which are based on values of leverage also specified in the IMs and asset betas, both of which are estimated as part of the IM Review. The first part of this section covers the airports' asset beta and the second part covers the energy networks' asset beta.

4.25 Leverage, and consequently equity betas, are considered at the end of both parts. Leverage is calculated using the same sample of comparators as for asset beta.

4.26 In the 2016 IM Review we applied a six-step process to estimate the equity beta. We followed the same process when estimating the equity betas for the Fibre IMs in 2020. As this process has not been disputed in submissions, and we have not identified any reason to change, we have continued with the same process in this review. The steps are:

4.26.1 Step 1: Identify a sample of relevant comparator firms;

4.26.2 Step 2: Estimate the equity beta for each firm in the sample;

4.26.3 Step 3: De-lever each equity beta estimate to get an estimated asset beta for each firm in the sample;

4.26.4 Step 4: Calculate an average asset beta for the sample;

4.26.5 Step 5: Apply any adjustments for regulatory differences or differences in systematic risk across services to the average asset beta for the sample; and

4.26.6 Step 6: re-lever the average asset beta for the sample to an equity beta estimate using the Commission's assumed notional leverage.

4.27 We have drawn on information obtained from:

4.27.1 Submissions in response to our Process and issues paper;

4.27.2 Our consultant, CEPA, which was asked to apply our 2016 method, including the six steps above, to calculate the asset betas using updated information (but not to provide advice on what the asset beta should be);

4.27.3 Comment on Auckland Airport's submission by Ben Marshall of Bela Enterprises', which included advice on how we could consider the implications of COVID-19 for estimating the asset beta for airports;[127]

[127] Ben Marshall, Nhut H. Nguyen, and Nuttawat Visaltanachoti "Comment on the Auckland Airport Input Methodologies Submission" (31 January 2023).

4.27.4 Submissions in response to our publication of CEPA's report, as well as our publication of a cover letter which asked for feedback on a range of issues;

4.27.5 Other regulatory decisions published since the 2016 review, including:

4.27.5.1 Our 2020 Fibre IMs;[128]

4.27.5.2 The 2022 United Kingdom (**UK**) airport regulator review of the asset beta for Heathrow airport;[129]

4.27.5.3 The 2023 AER RORI review for energy businesses;[130]

4.27.5.4 The 2022 Economic Regulation Authority (**ERA**) RORI review for gas pipeline businesses;[131] and

4.27.6 Our own analysis.

4.28 For the remainder of this section, we have focussed on steps 1, 4 and 5 as these are the steps where there is either contention in submissions, or where our analysis has indicated we need to make changes from the last review. We have used the CEPA findings as the starting point for our analysis.

Part 1. Airports

Current betas

4.29 The current asset beta for airports is 0.60, which includes a downward adjustment of 0.05 from the average of the comparator sample.

4.30 The current equity beta for airports is 0.74, based on a notional leverage of 19%.

New evidence for step 1: identifying a sample of comparator firms

4.31 In 2016 we used a sample of 26 firms from stock markets in Australia, Austria, China (including Hong Kong), Denmark, France, Germany, India, Italy, Japan, Malaysia, Malta, Mexico, New Zealand, Serbia, Spain, Switzerland, Thailand and Turkey.

[128] See Commerce Commission "Setting the 2020/21 fibre input methodologies" website.

[129] UK Civil Aviation Authority "Economic regulation of Heathrow Airport Limited: H7 Final Decision - Section 3: Financial issues and implementation" (March 2023).

[130] Australian Energy Regulator "Rate of Return Instrument 2022" website.

[131] Economic Regulation Authority "2022 Gas Rate of Return Instrument" (16 December 2022).

4.32 We were advised of a potential problem with our existing method in the submission by TDB Advisory for the BARNZ in response to our Process and issues paper:

> While we agree that overseas operators need to be included in the sample of comparable firms, the Commission's selection raises questions about the trade-offs between using a larger sample that may include firms that differ markedly from domestic operators, and a smaller sample of more similar firms. The larger sample should enable some smoothing across the more and less comparable operators, but if there is a disproportionate number of the latter – as we would argue is the case – then this smoothing loses some of its validity.
>
> On balance, we would prefer that a smaller sample of more comparable firms be used. We suggest that, in the Commission's current sample, the smaller operators that have primary responsibility for just one airport are likely to be more similar to their NZ counterparts than the very large, and often regional or even national, operators that are also included in the sample.[132]

4.33 The materiality of any change to the comparator sample depends on the combined effect it has on the asset beta, leverage and equity beta.

4.33.1 The comparator sample used by CEPA results in an asset beta of 0.74, notional leverage of 15% and an equity beta of 0.88.[133]

4.33.2 The comparator sample we are using results in an asset beta of 0.55, notional leverage of 26% and an equity beta of 0.74.

4.33.3 The WACC will be materially lower under our draft decisions, compared to CEPA's results, because the effect of the lower equity beta more than offsets the effect of the higher leverage (the simplified Brennan-Lally Capital Asset Pricing Model (**SBL-CAPM**) causes the WACC to increase when leverage is increased).

4.34 When we released the CEPA report we sought submissions on whether we should exclude some airport companies because the markets in which they operate are substantively different to the New Zealand market.

4.35 In response, CEG for NZAA indicated it prefers a large sample:

> the sample should be as large and diversified as possible, and if we do decide to shrink the sample then Auckland Airport should be given primary weight.

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[132] TDB Advisory "Process and Issues and draft Framework papers" (report prepared for Board of Airline Representatives New Zealand Inc., 11 July 2022), p. 7.

[133] As CEPA was asked to apply the same method we applied in 2016, these are the averages of the last two five-year periods.

we should not change the method just because the results point to a higher beta, because to do so would create an unpredictable regulatory environment and affect investor confidence.[134]

And

Focussing on one, or a limited, geography will increase the variance of the estimates because there will be a lack of diversity in the shocks being captured. These considerations point to the value of the NZCC sample having a diversified set of airports from many countries in order to maximise the effective diversity of economic shocks being analysed. Including airports from a large number of jurisdictions reduces the likelihood that our asset beta estimate is unduly influenced by specific shocks that were peculiar to a narrow set of economies during the estimation period.[135]

4.36 Qantas submitted that the sample should include firms that are comparable:

Qantas believes that airport securities used in the comparator sample should be selected on a stringent principle-based approach, covering the following factors:

1. Business Environment: Comparator airports should operate in a similar economic operating environment to that of a New Zealand airport. For example, Australian (e.g., ERA, IPART, QCA) and overseas regulators (CARR, CAR) apply either an explicit country filter approach or exclude based on market classification system i.e., exclude frontier and standalone markets.

2. Relative Risk: Comparator airports should display similar underlying business risk, including similar revenue stream drivers (aeronautical revenue supports a large share of total revenue), involvement of regulators and demand risk.

3. Robustness: Comparator airports need to have a reliable empirical beta estimate, whereby distortions driven by illiquidity and limited market index diversification should be considered in the filtering process. For example, as Auckland Airport contributes 6% to the local index, its beta estimate is overrepresented in systematic risk, introducing an upward bias.[136]

4.37 When Qantas applied these criteria the remaining firms in its sample are from share markets in Australia, Austria, France, Germany, Italy, Spain, China (Beijing Capital International Airport, trading in Hong Kong) and Switzerland. They excluded firms from China, Denmark, India, Japan, Malaysia, Malta, Mexico, Serbia, Thailand and Turkey.

[134] CEG "NZ Commission comments on asset beta estimates for airports" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for NZ Airports Association, 3 February 2023), p. 6.

[135] Ibid, para 155.

[136] Qantas "Submission on IM Review CEPA report on cost of capital" (17 February 2023), p. 1.

4.38 Evidence from other regulators indicates a preference to have a sample of relatively close comparators:

4.38.1 the UK Civil Aviation Authority (**CAA**) uses a detailed analysis of markets to exclude companies; under their method Auckland Airport and Sydney Airport are excluded because the economies are not considered comparable to the UK. The only countries included for its decision on Heathrow Airport were from three countries: France, Germany and Spain.[137]

4.38.2 the AER excludes international energy companies from its sample even though it has only one firm in its sample that is currently trading on the Australian Stock Exchange (although it has decided to continue to use recently delisted firms as well). The AER states:

> international firms likely have different characteristics and operating and market environments to the regulated 'pure play' Australian energy network businesses and, as a result, may not be directly comparable to those we regulate.[138]

4.38.3 the ERA includes international energy companies in their comparator sample but only from Canada, New Zealand, United Kingdom and United States. The ERA states:

> With regard to regulatory characteristics, the ERA looks to countries where energy networks operate under similar regulatory, legal and other institutional arrangements to those in Australia.
>
> With regard to market factors, the ERA looks to countries with capital markets that are sufficiently deep, liquid, large and informationally efficient.
>
> 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.[139]

4.39 For the Fibre IMs, we used firms from Czech Republic, Japan, New Zealand, Poland, Singapore, South Korea, UK, the United States (**US**), and Western Europe. We decided to exclude companies from Turkey because of their high market risk premium compared to New Zealand.[140]

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[137] UK Civil Aviation Authority "Economic regulation of Heathrow Airport Limited: H7 Final Decision - Section 3: Financial issues and implementation" (March 2023), p. 3.

[138] AER "Rate of Return Instrument Explanatory Statement" (February 2023), p.19.

[139] Ibid, p. 179.

[140] Commerce Commission "Fibre input methodologies: Main final decisions - reasons paper" (13 October 2020), p. 424.

4.40 For our energy comparator sample in the 2016 IM Review, we used firms from New Zealand, United States and United Kingdom.

4.41 Our conclusion from this survey of regulators is that it is common practice among regulators to ensure companies in the sample are trading in markets that are comparable to the host country, that is have similar systematic risk. CEG's view that we should include a sample as large and diversified as possible is not standard practice and we do not support that approach.

4.42 As noted above, Qantas proposed we consider business environment (similar economic operating environment), relative risk (similar revenue stream drivers, involvement of regulators and demand risk) and robustness (reliable asset beta estimates) as criteria when selecting the comparator sample.

4.43 We broadly agree with Qantas' proposal and have used the following method to remove firms from the sample that we do not consider are comparable to a major airport trading in New Zealand.

4.43.1 Remove firms that operate in markets that are substantively different to New Zealand. We have used the Financial Times Stock Exchange (**FTSE**) Equity Country Classification and market risk premium as indicators.

4.43.1.1 CEG submitted that we should not consider the market risk premium of a country because equity beta estimates are standardised (the average risk firm in a market has an equity beta of 1).[141] However, we consider the market risk premium is useful as an indicator of countries that may have a materially different risk profile, and therefore trading environment, to New Zealand. There is a strong correlation between the classification of countries in the FTSE Equity Country Classification and market risk premium (**MRP**).

4.43.2 Remove firms that have unusually variable asset beta estimates. We have used bid-ask spreads, percentage of shares traded (free float %), and variability in asset beta across estimation method (daily, weekly and four-weekly) as indicators.

4.43.3 Remove firms that have unusual business financing structures that create anomalies when converting the observed equity betas to asset betas. We have used leverage as an indicator where an issue is highlighted if leverage is negative.

[141] CEG "NZ Commission comments on asset beta estimates for airports" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for NZ Airports Association, 3 February 2023), section 4.3.

4.43.4 Remove firms that have business characteristics that are not comparable to a major airport operating in New Zealand. Our standard practice, which CEPA has applied, is to exclude firms that have delisted, are not involved in regulated airport operations, have a low percentage of aeronautical revenues, or had a low percentage of days traded.[142]

4.44 We have not used a mechanistic method (precise thresholds) when applying these indicators, but rather have applied judgement based on the information across the indicators when considering whether to exclude a firm from our comparator sample. We have provided a table in Appendix A to show how we have applied our judgment for each firm. We are balancing the risk of having a small sample with the risk of including firms that are poor comparators, while acknowledging that there is inherent error in measuring correlations across erratic share-market data.

4.45 Our draft decision is to include eight comparator firms: Aeroports de Paris (France), AENA (Spain), Beijing Capital International Airport (China), Flughafen Wien (Austria), Flughafen Zurich (Switzerland), Fraport (Germany), Sydney Airport (Australia) as well as Auckland Airport. We welcome submissions on the choices that have been made.

4.46 We have reviewed the sample proposed by Qantas and, based on the factors above, consider it reasonably consistent with the sample we have established. Compared to the sample proposed by Qantas, our sample excludes the firm from Italy (major airport is Bologna) because of its unreliable asset beta estimates. Qantas also has concerns about including this firm in the post-Covid sample because of its wide trading margin.

4.47 We agree with Qantas that Sydney airport should be included because it was only delisted in March 2022 and it is from a market that has proximity and comparability to the New Zealand market.

4.48 When calculated using our existing method in step 4, the unadjusted asset beta is 0.63. In comparison, the CEPA update of our existing method resulted in an asset beta of 0.79 (before the negative adjustment of 0.05) and the Qantas proposal resulted in an asset beta of 0.63.

New evidence for step 4: calculating the average asset beta for our comparator sample

4.49 Our current method for step 4 involves placing the most weight on the combined average of the asset beta for the last two five-year periods.

[142] At the 2016 IM review, we included two firms from Japan that were not airport owners but provided services to airports and we indicated we would review their inclusion at this review. CEPA has excluded these firms from the comparator sample on the basis that they were either not involved in regulated airport activities or had a low percentage of aeronautical revenue.

4.50 COVID-19, however, has caused us to question whether the current method is appropriate for estimating the asset beta for airports. Airports were impacted substantially by COVID-19 and the associated restrictions on passenger travel, including lockdowns. Auckland Airport was affected to the extent that it raised additional equity to support its balance sheet and extended maturity dates on bank loans.[143]

4.51 We sought advice from Bela Enterprises on how we should consider the asset beta in the context of COVID-19.[144] Their advice was that we need to make the best estimate of asset beta for the next regulatory period, which involves identifying the extent that COVID-19 had a systematic effect on the asset beta, and also the likelihood that a similar event could happen in the near future.

4.52 There is evidence the asset beta for airports increased in the 2020-2022 period. Using our proposed sample, the asset beta varies from 0.48 for 2012-2017, to 0.57 for 2018-2020, to 0.81 for 2020-2022 (the 2020 date is 28 February to coincide with COVID-19).

4.53 The use of the revised sample is important for the purpose of analysing the effects of COVID-19 because it removes unnecessary noise in the comparator sample.

4.54 A clearer picture emerges when we break the data into separate periods:

4.54.1 The average asset beta for the pre-COVID-19 periods of 2007-2012, 2012-2017 and 2018-Feb 2020 combined is 0.53;[145]

4.54.2 The average weekly asset beta for the first 10 weeks of COVID-19 (which we have represented by the New Zealand lockdown period of 28 Feb 2020 to 13 May 2020) was 0.93;[146]

4.54.3 The average weekly asset beta for 14 May 2020 to 30 September 2022 was 0.70[147]; and

4.54.4 The average weekly asset beta for 1 October 2021 to 30 September 2022 was 0.56.[148]

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[143] Auckland Airport "Respond Recover Accelerate Annual Report 2020" (2020),p. 9.

[144] Ben Marshall, Nhut H. Nguyen, and Nuttawat Visaltanachoti "Comment on the Auckland Airport Input Methodologies Submission" (31 January 2023).

[145] This uses averages of four-weekly and weekly asset betas. The average weekly asset beta over this period was 0.53.

[146] The daily asset beta for this period was 0.73.

[147] The daily asset beta was 0.62.

[148] The daily asset beta was 0.50.

4.55 This data indicates that the more intense period of COVID-19 uncertainty may have added approximately 0.4 to the previous long term airport asset beta of 0.53.

4.56 There are different ways of interpreting the data. As the asset beta for 1 October 2021 to 30 September 2022 (0.56) was similar to the pre-COVID-19 beta (0.57 for the two years prior or 0.53 for the 13 years prior), it is possible COVID-19 was not a systematic event and that the market has treated the COVID-19 period as having an anomalous effect on airports that was subsequently discounted. The weakness of this interpretation is that it relies on evidence from a short timeframe (12 months) and less confidence can be placed on asset betas calculated over short periods.

4.57 An alternative interpretation is that COVID-19 was, at least in part, a systematic event and the pandemic provided new information about the relative risk of investing in airports that can be affected by government responses and consumer behaviour associated with a pandemic. This is the interpretation the UK CAA came to and is the reason they made an upward adjustment to the pre-COVID-19 asset beta in their recent consideration of the asset beta for Heathrow airport.

4.58 The adjustment to the pre-COVID-19 asset beta by the UK CAA was based on a calculation of the effect pandemics could be expected to have on the asset beta if they occurred once in a set number of years (the UK CAA's consultant Flint assumed a range of 20 – 50 years and a duration of 17 – 30 months).[149]

4.59 Our estimate of a pre-COVID-19 asset beta of 0.53 is similar to the CAA's pre-COVID-19 asset beta of 0.5.[150]

4.60 The UK CAA analysis, conducted by their consultant Flint, based on regression analysis, suggests the amount added to the pre-COVID-19 beta is in the range of 0.04 to 0.14.[151]

4.61 TDB Advisory for BARNZ has replicated the Flint analysis using the Auckland Airport data, and it calculates the pandemic adjustment range of 0 to 0.08:

> Overall we find that an event similar in nature and impact to COVID-19, occurring between once every 20 and once every 50 years, would increase the beta estimate for AIAL by between zero and 8 basis points, compared to recent pre-COVID observed values.[152]

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[149] Flint "Support to the Civil Aviation Authority: Estimating Heathrow's beta post-Covid-19" (August 2021), p. 17.

[150] Ibid, p. 3.

[151] Ibid, p.3.

[152] TDB Advisory "Auckland International Airport asset beta Covid-19 adjustment using Flint study" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for Board of Airline Representatives NZ (BARNZ), 3 February 2023), p. 8.

4.62 The Flint and TDB Advisory method involves assigning weights to the pre-COVID-19 and COVID-19 betas to simulate the effects of a pandemic occurring at different intervals and with different intensity. We have checked the intuition behind the TDB Advisory analysis by undertaking a simplified calculation, using the pre-COVID-19 asset beta for Auckland Airport and the asset beta during the 10-week lockdown period from the end of February 2020 to mid-May 2020:

4.62.1 Our estimate of the weekly asset beta for Auckland Airport prior to 28 February 2020 is 0.82, which is similar to the TDB Advisory estimate of 0.83;[153]

4.62.2 The weekly asset beta for Auckland Airport for the 10-week lockdown period was 1.24 and for the period May 2020 to September 2022 was 0.95. This indicates COVID-19 added between 0.12 and 0.41 to the asset beta;

4.62.3 To calculate an upper bound adjustment, we assume a COVID-19-like event occurs once every 20 years, and lasts 18 months, which is the equivalent of 7.5% of the time. For any regulatory period, the asset beta is calculated as the pre-Covid-19 beta with a weight of 92.5% and the COVID-19 beta with a weight of 7.5%. For a pre-COVID-19 beta of 0.82, and a COVID-19 beta of 1.24, the asset beta would be 0.85. This is the same result obtained by TDB Advisory using weekly asset betas;[154]

4.62.4 To calculate a lower bound adjustment, we assume a COVID-19-like event occurs every 50 years, and lasts for three months, which is the equivalent of 0.5% of the time. For a pre-COVID-19 beta of 0.82 and a COVID-19 beta of 1.24, the asset beta would be only slightly higher than 0.82; and

4.62.5 Note that we consider this analysis as indicative as it uses asset betas calculated over short periods, which are not as reliable as asset betas calculated over longer periods.

4.63 We note that TDB Advisory's calculation of the upper bound of 0.08 is based on monthly data and appears to be an outlier compared to the daily and weekly results that TDB Advisory reported for the upper bound. The range excluding the monthly data for the upper bound scenario is 0.01 - 0.04.

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[153] Our pre-COVID-19 estimate is a weighted weekly average of the 2 years to 28 February 2020, which was 0.78; the five-year period 2012-17, which was 0.97; and the five-year period 2007-12, which was 0.69. TDB Advisory used the period August 2017 to February 2020 and July 2021 to August 2022.

[154] See table 2 TDB Advisory "Auckland international airport asset beta Covid-19 adjustment using flint study" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for Board of Airline Representatives NZ (BARNZ), 3 February 2023), p. 7.

4.64 We have also applied our check using our comparator sample rather than Auckland Airport. For a pre-COVID-19 asset beta of 0.53, with a weight of 92.5% and a COVID-19 asset beta of 0.93 with a weight of 7.5%, the weighted average is 0.56. This increase of 0.03 is considered an upper value. However, again note that this analysis is indicative only as it is based on asset betas calculated over short periods.

4.65 An alternative approach has been proposed by CEG for NZAA. CEG submits that COVID-19 has provided reasons to estimate asset betas at the start of a regulatory period (or on a periodic basis for firms not subject to price-quality regulation) rather than set asset betas in the IMs with the IMs instead specifying that the estimation period should be 10 years (or multiples of the regulatory period).[155] CEG submits:

> There is no bias in the proposed methodology because the methodology will, on average and over time, accurately reflect and compensate for the scale and frequency of all shocks.[156]

4.66 We consider the options for setting the asset beta are:

4.66.1 Option 1: Use the long-term pre-COVID-19 average of 0.53. This assumes the post-pandemic data is unreliable and that the pandemic was not a systematic event;

4.66.2 Option 2: Exclude the asset beta data for the period from February 2020 to September 2021 and apply an asset beta within the range of 0.53 to 0.56. This assumes the pandemic was not a systematic event but places some weight on the post-pandemic data;

4.66.3 Option 3: Use the long-term pre-COVID-19 average of 0.53 and add a premium of 0 to 0.04, which gives a range of 0.53 to 0.57; we could apply the midpoint of 0.55. This assumes the pandemic was a systematic event. The result is similar to the asset beta calculated for the 12 months to September 2022 (0.56) which is consistent with the market assigning a small premium to the airports asset beta;

4.66.4 Option 4: Use 0.63, which is the result from continuing to use the average of the last two five-years. This method gives the higher asset beta during the pandemic a weighting of about 15% because the asset beta was elevated for a period of about 18 months. This also assumes the pandemic was a systematic event; and

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[155] TDB Advisory "Auckland international airport asset beta Covid-19 adjustment using flint study" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for Board of Airline Representatives NZ (BARNZ), 3 February 2023), section 3.2.

[156] CEG "NZ Commission comments on asset beta estimates for airports" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for NZ Airports Association, 3 February 2023), para 63.

4.66.5 Option 5: Change the approach so that the asset beta is determined immediately prior to a regulatory period, using a 10-year period, as proposed by CEG for NZAA. This rolling-average approach assumes firms will be adequately compensated over time, without the need for any adjustment, for pandemics or other events that affect the asset beta.

4.67 Our view is that it is likely that COVID-19 provided new information that had not been included in the market's assessment of the airport asset beta, that the spike in the asset beta during the early stages of COVID-19 would be repeated in future pandemics, and that investors have repriced and reweighted airports in their efficient portfolio of investments. Therefore, we have placed less weight on option 1. We consider the most appropriate way of setting the asset beta in the circumstances is to apply a premium to the pre-COVID-19 long term average asset beta. This premium is uncertain; however, we consider it likely falls within the range of 0 to 0.04.

4.68 We do not consider it appropriate to use option 4 because in our view this would place too much likelihood of a COVID-19-type event occurring during the term of the IMs.

4.69 We do not support the CEG proposal for the equity beta to be removed from the IMs and determined at the time of price reviews (option 5). We consider that specifying the equity beta in the IMs provides certainty for suppliers and that, on balance, this should be given more weight than determining an estimate of the equity beta that on average compensates suppliers for systematic risk over a long period of time.

4.70 In the circumstances, the asset beta is a matter of judgement, and we propose an asset beta of 0.55. This value is within the narrow range of estimates of 0.53 to 0.56 calculated using options 2 and 3. We cannot be certain about the extent that we should add a premium to the pre-COVID-19 average and there is a possibility that COVID-19 was a non-systematic event. The value of 0.55 is consistent with adding a premium of 0.02 to the asset beta to account for COVID-19-type events occurring in the future. Given estimation error, it is also not inconsistent with the asset beta calculated over the 12 months to 30 September 2022 of 0.56 and our estimate of the pre-COVID-19 asset beta of 0.53.

4.71 We have provided a table showing the asset beta calculations for the proposed comparator sample for various periods and estimation frequencies in Appendix B.

New evidence for step 5: applying any adjustments

4.72 In 2016 we reduced the asset beta from the sample by 0.05 (from 0.65 to 0.6). We considered 0.65 to be the upper bound because it included firms with non-aeronautical services.

4.73 We were concerned that using a beta of 0.65 would overstate the beta for Auckland Airport's specified airport services (which are generally aeronautical services) because it was overly affected by non-aeronautical services, such as retail leasing.

4.74 Our previous decision was based on information that Auckland Airport, Deutsche Bank and PwC had either stated or used a higher asset beta for non-aeronautical services, and that the UK CAA at the time applied a lower asset beta for Heathrow and Gatwick than the 0.65 we calculated from the sample.

4.75 In response to our Process and issues Paper, Auckland Airport and its consultant LJK Consulting submitted there is no evidence that aeronautical services are lower risk. Their regression analysis indicates airports with higher non-aeronautical shares of revenue have lower asset betas. They also analysed revenue by segment at Auckland Airport and did not find non-aeronautical revenue was higher risk.

4.76 Auckland Airport's consultant LJK Consulting provided information on the proportion of non-aeronautical revenue for the following companies in the revised sample (for financial year 2019). When we compare the LJK Consulting data to the pre-COVID-19 betas from step 1, the correlation coefficient between non-aero share and asset beta is 0.08, which indicates no correlation.

4.77 The submission by CEG for NZAA included analysis of aeronautical and non-aeronautical revenues from 2018 to 2021, which concluded that the relationship between asset beta and non-aeronautical revenues is negative. CEG concluded that the 0.05 downward adjustment for airports was not justified on conceptual grounds, and the evidence supported an upwards adjustment.[157]

4.78 Our analysis supports the findings by LJK Consulting and CEG that there is no statistical evidence of a positive relationship between asset beta and proportion of revenue that is non-aeronautical (based on the LJK data).

4.79 We received advice from Bela Enterprises on how we could undertake a more comprehensive analysis of whether the adjustment is required.[158] We have decided not to undertake this analysis, as we are sufficiently persuaded that an adjustment is not necessary. However, we welcome submissions on this matter.

4.80 Our draft decision is that a downward adjustment to the asset beta is not justified.

New evidence for step 6: calculating the equity beta

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[157] CEG "NZ Commission comments on asset beta estimates for airports" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for NZ Airports Association, 3 February 2023), section 2.

[158] Bela Enterprises "Report on Auckland International Airport Ltd Asset beta submission" (report to the Commerce Commission, 31 January 2023).

4.81 The IMs specify the equity betas, not the asset betas. The equity betas are calculated in step 6, by using the average leverage of our comparator sample (see paragraphs 5.5 to 5.18 for our more detailed consideration of leverage).

4.82 For airports, our draft decision is that leverage is 26%, compared to 19% in 2016. Leverage is higher largely because we have excluded firms from China with very low or negative leverage. If we had continued to use the same method for selecting the comparator sample as in 2016 the leverage would have been 15% (as calculated by CEPA).

4.83 With an asset beta of 0.55, the equity beta is 0.74 (compared to 0.74 in 2016 and compared to CEPA's calculation of 0.88).

Part 2: Energy

Current betas

4.84 The current energy asset betas are:

4.84.1 0.35 for EDBs and Transpower; and

4.84.2 0.40 for GPBs, which included an uplift of 0.05 compared to the EDBs and Transpower.

4.85 The current equity betas are:

4.85.1 0.60 for EDBs and Transpower, based on a notional leverage of 42%; and

4.85.2 0.69 for GPBs, based on a notional leverage of 42%.

New evidence for step 1: identifying a sample of comparator firms

4.86 In 2016, the energy comparator sample included companies from New Zealand, Australia, United States, and United Kingdom. Since 2016, Australian companies Ausnet and Spark Infrastructure have been delisted and APA has been excluded by CEPA because it has low regulatory revenue. Now only four companies in the sample of 54 are not from the US; three are from the UK and one (Vector) is from New Zealand.

4.87 Oxera for the 'Big 6' EDBs proposed we refine the sample to remove companies from the United States that are less comparable.

> In practice, the NZCC could refine its sample of comparators by reviewing the characteristics and comparability of US-based utilities in more detail. These companies account for over 60 of the comparators in the NZCC's sample, and not all of them will be subject to the same type of regulatory regime as in New Zealand. Specifically, as was also noted by Dr Lally, some US-based utilities are subject to rate-of-return regulation rather than price cap regulation as in New Zealand. Removing some of the less comparable companies from the sample would reduce the NZCC's sample to a size more comparable to that of Ofgem and the AER.[159]

4.88 We do not consider it practical to restrict the sample to only those companies that are regulated in a similar way as in New Zealand because this would exclude many of the US companies, and in our view the most important characteristic of an energy comparator is whether it is an energy utility rather than an energy utility regulated in a comparable manner. However, we note Oxera's reference to Dr Lally's view that the regulatory settings in New Zealand create greater risk for firms than do the regulatory settings in the US.[160]

4.89 ENA does not support CEPA's decision to exclude two firms that have a low percentage of regulated revenues from the comparator sample.[161] One of the firms, UGI Corp was excluded because its utilities activities account for 14% of total revenue. We agree with CEPA's assessment that this firm should be excluded. However, we agree with the ENA that APA Group, as one of the major gas pipeline businesses in Australia, is a relevant comparator that should be included in the sample, even though it has a low percentage of regulated revenues.

4.90 Oxera submitted that we should remove illiquid companies from the comparator sample.

> We also consider that the comparator sample used by the NZCC includes illiquid companies, which can result in a mis-statement of the equity beta. Filtering out illiquid companies reduces the impact that illiquid stocks can have in driving the results, which is particularly important if the NZCC chooses to align with international regulatory precedent in selecting a smaller sample.[162]

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[159] TDB Advisory "Auckland international airport asset beta Covid-19 adjustment using flint study" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for Board of Airline Representatives NZ (BARNZ), 3 February 2023), p. 35.

[160] Ibid, p. 35.

[161] Electricity Networks Association (ENA) - Rate of return issues -"Submission on IM Review CEPA report on cost of capital" (3 February 2023), p. 12. The firms are UGI Corp from the United States and APA Group from Australia. See CEPA "Report on Cost of Capital 2022/ 2023" (report to the Commerce Commission 'IM Review 2023', 29 November 2022), p. 9.

[162] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big , 3 February 2023), p. 35.

4.91 We have reviewed the sample prepared by CEPA by considering the reliability of the asset beta estimates. We have used bid-ask spreads, percentage of shares available for trading and variability in asset beta across estimation method (daily, weekly and four-weekly) as indicators. As with the airport sample, we have not used a mechanistic method when applying these indicators, but rather have used our judgement based on the information across the indicators when considering whether to exclude a firm from the comparator sample.

4.92 This review has highlighted the following firms that we have removed from the sample:

4.92.1 RGCO from the US, which has a bid-ask spread of 2.5% (the median bid-ask spread is 0.06%). RGCO is an outlier compared to other firms in the sample, with weekly and four-weekly asset betas near zero for the last two five-year periods;

4.92.2 Avangrid Inc from the US, which has a negative four-weekly asset beta for 2012-17 and a free float percentage of 18% (compared to a median of 99.4%);

4.92.3 Unitil Group from the US, which has a bid-ask spread of 0.78% and a variability in asset beta of 0.22 in 2017-2022;

4.92.4 Chesapeake Utilities Corp from the US, which has a bid-ask spread of 0.50% and a variability in their asset beta of 0.19;

4.92.5 MGE Energy Inc from the US, which has a bid-ask spread of 0.39% and a variability in asset beta of 0.24 in 2017-2022 and 0.28 in 2012-2017; and

4.92.6 Northwest Natural Gas Co from the US, which has a bid-ask spread of 0.21% and a variability in asset beta of 0.21 in 2017-2022.

4.93 A firm that had indicators of concern was Vector. It has a bid-ask spread of 0.45% and a free float percentage of 24.9%. However, we have left Vector in the sample because it has an asset beta variability of 0.03, which is relatively low compared to the firms above. We also consider Vector an important comparator because it is the only New Zealand firm in the sample.

4.94 There are other firms with high asset beta variability (for example, ONEOK Inc has a variability of 0.33 in 2017-2022). However, we have left these firms in the sample because their bid-ask spreads and free float percentages were not also a concern.

4.95 Of the 51 remaining firms in the CEPA sample, the bid-ask spreads (excluding Vector) range from 0.02% to 0.16% with a median of 0.05%, the free float percentages (excluding Vector) range from 87.39% to 99.99%, with a median of 99.4%, and the variability in asset betas range from 0 to 0.33, with a median of 0.08.

4.96 Removing the firms from the sample does not have a material effect on the asset beta. The average asset beta for the last two five-year periods in the refined sample is 0.36, which compares to 0.35 before these firms are removed. However, removing the firms does affect the standard errors of the asset beta, which are used in the broader WACC calculation.

4.97 We have noted recent decisions from Australia that indicate a concern that relying too much on international companies may not produce a reasonable set of comparators.

4.97.1 The AER uses only Australian companies, including delisted companies[163]; and

4.97.2 The ERA in Western Australia uses delisted Australian and international companies.[164]

4.98 We consider the comparator sample could be improved by including the Australian companies that were recently delisted, as a way of reducing the over-reliance on firms from the United States. We have added Ausnet Services and Duet but we have not added Spark Infrastructure as it uses hybrid securities which give it an artificially low leverage.[165]

4.99 In conclusion, we have decided to modify the CEPA sample as indicated in this section. We have provided a table in Attachment B that provides the relevant indicators for each firm and summarises the reasons for including or excluding firms from the sample. The table includes leverage as an indicator; however, we did not find any indicators of concern (as we did with airports where some firms had negative leverage).

New evidence for step 4: calculating the average asset beta for our sample

[163] AER "Rate of Return Instrument Explanatory Statement" (February 2023), p. 10 -11 and 19.

[164] Economic Regulation Authority "Explanatory statement for the 2022 final gas rate of return instrument" (16 December 2022), p. 6 and 179.

[165] Hybrid securities have both debt and equity characteristics, which make it difficult to estimate a firm's leverage.

4.100 There are three issues related to step 4. The first is whether we should give more weight to daily betas. The second is whether we should weight the sample by country. The third is how we should deal with the effects of COVID-19.

Issue 1: should we give more weight to daily betas?

4.101 Our current practice is to calculate daily, weekly and four-weekly asset betas but to give primary weight to the weekly and four-weekly values.

4.102 At the 2016 IM Review, we said:

> We note there is a trade-off between problems of weekly/monthly betas and daily betas:
>
> Daily asset beta estimates can be distorted by low liquidity stocks. It is important to measure contemporaneous changes in the individual firm's share price and the relevant market index. The shorter the estimation interval used, the more difficult it is to capture a contemporaneous link.
>
> Weekly and monthly asset beta estimates, on the other hand, lead to fewer observations being available when undertaking the regression analysis. This can affect the statistical significance of the results.
>
> In reaching our decision to give primary weight to weekly and four-weekly betas, we note that:
>
> Our approach of averaging weekly and four-weekly betas across all possible reference days significantly reduces any concerns about a lack of observations for weekly and monthly estimates.
>
> Although international evidence based on regulatory precedent and academic papers is ambiguous, a recent study of evidence implies that low frequency beta estimates should always be preferred to high frequency beta estimates.[166]

4.103 Oxera for the 'Big 6' EDBs proposed we give more weight to daily betas:

> We recommend that, when the stocks included in the sample are liquid, a daily observation frequency is used and when illiquid stocks cannot be excluded from the sample, a weekly observation frequency is used.[167]

4.104 As noted above we have reviewed the sample for liquidity and have removed an additional firm from CEPA's sample.

4.105 We have also checked the practice by Australian regulators and note the AER, Queensland Competition Authority (**QCA**) and ERA use weekly data. QCA's reasoning is that weekly data:

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[166] Commerce Commission "Input methodologies review decisions - Topic paper 4: Cost of capital issues (20 December 2016) paras 306-307. The research referenced was Alan Gregory, Shan Hua and Rajesh Tharyan "In search of beta" (April 2015).

[167] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big 6' EDBs, 3 February 2023), p. 35.

strikes a balance between having a large number of observations and also being unlikely to capture statistical noise that might possibly be accompanied by higher-frequency (e.g. daily) return intervals.[168]

4.106 QCA also indicated that it prefers weekly to four-weekly estimates because the weekly estimates have lower standard errors.[169]

4.107 We note that the Water Services Regulation Authority (**Ofwat**) uses daily data on the basis that it maximises the number of data points and allows for more precise and less volatile estimates.[170]

4.108 The issue of which method to put weight on is material, because as the following data shows for our comparator sample, the weekly estimates are greater than the four-weekly estimates and the daily estimates are higher than the weekly estimates.

Table 4.1 Asset betas for the energy comparator sample, by period and frequency

	2007-12	2012-17	2017-22
Daily	0.38	0.38	0.41
Weekly	0.35	0.35	0.40
Four-weekly	0.33	0.31	0.37

4.109 Our current method of giving primary weight to weekly and four-weekly estimates results in an asset beta of 0.36, whereas weekly estimates would give a value of 0.37 and daily estimates would give a value of 0.40 (all based on the last two five-year periods for illustrative purposes).

4.110 The standard errors of the different estimation methods are shown in the following table. The standard errors of the four-weekly estimates are higher than the standard errors of the daily and weekly estimates for 2017-2022 but not for the other periods. This table is inconsistent with QCA's view that weekly estimates have lower standard errors than four-weekly estimates.

Table 4.2 Standard errors for the energy comparator sample, by period and frequency

	2007-12	2012-17	2017-22
Daily	0.11	0.12	0.11
Weekly	0.11	0.14	0.14
Four-weekly	0.11	0.11	0.16

[168] Queensland Competition Authority "Final report: Rate of return review" (November 2021), p. 77.

[169] Ibid, p. 77.

[170] Ofwat "Creating tomorrow, together: consulting on our methodology for PR24" "Appendix 11 - Allowed return on capital" (July 2022), p. 15.

4.111 We have considered the proposal by Oxera to use daily estimates for liquid stocks and weekly estimates for the less liquid stocks. However, we consider that there is an issue with using daily estimates due to statistical noise associated with daily movements. We are also not aware of any research evidence that has invalidated the findings by Gregory et.al (2015) that low frequency estimates should be preferred over high frequency estimates. Further, our preference is to exclude firms that have unreliable beta estimates rather than to include these firms using a lesser frequency estimation method.

4.112 Overall, we propose continuing to place primary weight on the average of weekly and four-weekly estimates to calculate the asset beta.

Issue 2: Should we weight the sample by country?

4.113 In 2016 we calculated the asset beta as the average of the sample. With the change to the sample, there is a risk that this averaging method is placing too much weight on the US market.

4.114 There is a regulatory precedent for weighting by country. The ERA weighted equally the estimates from each country in its international sample (it refers to this as 'country pooling'):

> The ERA applies country pooling for the 2022 final gas instrument. The ERA considers that this approach allows for the examination of country specific effects that may not be apparent under a full pooling approach, along with visibility over any variability of estimates within each country. This may reveal differences between countries that would otherwise be difficult to quantify, allowing for adjustment via regulatory discretion.[171]

4.115 Weighting equally the US, UK, New Zealand and Australia countries results in an asset beta of 0.35 which is slightly lower than the value of 0.36 without the weighting.

4.116 As the weighting does not have a material effect on the asset beta results, we propose, based on simplicity and consistency with prior practice, that we continue with the existing method.

Issue 3: How should we deal with the effects of Covid-19?

4.117 We have calculated the average asset betas for different periods:

[171] Economic Regulation Authority "Explanatory statement for the 2022 final gas rate of return instrument" (16 December 2022), para 1089.

4.117.1 the asset beta varies from 0.34 for 2007-2012, 0.33 for 2012-2017, 0.20 for 2018-2020 and 0.44 for 2020-2022.[172]

4.118 It is not clear why the asset beta was lower for the two years prior to COVID-19. However, even if this was an anomalous period there is evidence the asset beta for energy increased in the 2020-2022 period.

4.119 A clearer picture emerges when we break the data into separate periods[173]:

4.119.1 The average asset beta for the pre-COVID-19 periods of 2007-2012, 2012-2017 and 2018-Feb 2020 combined is 0.31;[174]

4.119.2 The average weekly asset beta for the first 10 weeks of COVID-19 (which we have represented by the NZ lockdown period of 28 Feb 2020 to 13 May 2020) was 0.60;[175]

4.119.3 The average weekly asset beta for 14 May 2020 to 30 September 2022 was 0.34[176]; and

4.119.4 The average weekly asset beta for 1 October 2021 to 30 September 2022 was 0.36.[177]

4.120 This data indicates that the more intense period of COVID-19 uncertainty may have added approximately 0.29 to the previous long term asset beta of 0.31.

4.121 We note that the percentage increase in the long-term asset beta during the intense period of COVID-19, at 94%, was higher than the percentage increase for airports, at 75%. This is somewhat surprising given lockdowns and border closures were expected to have a greater effect on airports than on energy networks. However, asset betas calculated over shorter periods may be unreliable compared to asset betas calculated over longer periods.

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[172] These asset betas are the averages of weekly and four-weekly values. Note the 2018-2020 estimate finishes at 28 February 2022, which approximates the start of COVID-19, and the 2020-22 estimate is for two years commences just after that date.

[173] We have used weekly and four-weekly values for the pre-Covid-19 estimates, but weekly values for the post-Covid-19 estimates, as we are wanting to make the best estimates possible and for the more recent estimates we are limited to weekly data.

[174] This uses averages of four-weekly and weekly asset betas. The average weekly asset beta over this period was 0.32.

[175] The daily asset beta for this period was 0.58.

[176] The daily asset beta was 0.31; the four-weekly asset beta was 0.30.

[177] The daily asset beta was 0.27; the four-weekly asset beta was 0.37.

4.122 We have calculated an adjustment to the long-term pre-COVID 19 asset beta to account for the likelihood that COVID-19 has increased the asset beta, in the manner adopted for airports.

4.122.1 For a pre-COVID-19 asset beta of 0.31, with a weight of 92.5% and a COVID-19 asset beta of 0.60 with a weight of 7.5%, the weighted average is 0.33.[178] This increase of 0.02 is considered an upper value. A mid-point adjustment would be 0.01.

4.123 The Australian energy network regulators considered whether to change the method due to COVID-19:

4.123.1 The AER concluded that the longest estimates available, which are 14 years, are the most stable and therefore the most statistically robust estimates of beta for energy companies; they considered that five-year estimates are also useful (for "limited consideration") although subject to more statistical noise and estimation error; and

4.123.2 The ERA added the 10-year beta estimates to the information they consider, which had previously been the five-year estimate and a non-ordinary least squares estimation method that reduces the effect of outliers.

4.124 Our options are the same as for the airports' asset beta decision. We note the calculation of the adjusted energy asset beta, of 0.31 + 0.01 = 0.32 is less than the average asset beta of the last two five-year periods (0.36). However, the average for the last two five-year periods is the same as the value for 1 October 2021 to 30 September 2022 (0.36).

4.125 As for the airports decision, the choice of asset beta for energy in the circumstances is a matter of judgement. We have concluded that the asset beta is likely to fall in the range of 0.32 to 0.36 and our draft decision is to use a value of 0.35. Given estimation error, we consider this value is not inconsistent with the various interpretations of the effect COVID-19 might have had on the asset beta, and particularly given the uncertainty associated with the extent that COVID-19 was a systematic event.

Conclusion regarding step 4

4.126 We are proposing to adopt a value of 0.35 as the value of asset beta that best represents the information in our comparator sample.

New evidence for step 5: applying any adjustments

[178] See paragraph 4.62.3 for an explanation of why we are using these percentages.

4.127 In 2016, we used a combined electricity and gas sample but provided a 0.05 uplift to the gas pipeline businesses (we had provided a 0.1 adjustment in 2010).

4.128 Our justification in 2016 was:

4.128.1 gas has a higher income elasticity of demand than electricity, based on modelling by HoustonKemp;

4.128.2 the risk of economic network stranding of the gas pipeline assets due to a drop in economic activity is higher in New Zealand relative to the companies in the comparator sample because a relatively low proportion of New Zealand households are connected to gas and this may also imply greater growth options; and

4.128.3 we preferred using an uplift to estimating asset betas using separate samples for gas and electricity. The reasons included the gas sample is entirely US companies (and evidence by CEG and TDB Advisory indicating little difference in systematic risk between electricity and gas businesses in the US), and the estimates of gas asset beta vary significantly based on different approaches suggested by consultants.[179]

4.129 We also noted, however, that a chart of asset betas from 1996 -2006 did not indicate a persistently higher asset beta for the gas sub-sample.

4.130 We have considered separately the matters of (a) whether we should separate the sample into gas and electricity; and (b) whether we should continue to apply an uplift for gas, and if so by how much?

4.131 We have not considered making an adjustment to the asset beta for energy networks because this matter has not been raised in submissions and we are not aware of any reason for doing so.

Creating separate gas and electricity samples

4.132 This section considers whether the systematic risk of gas firms and electricity firms in our comparator set is sufficiently different to separate out a gas and electricity asset beta.

4.133 When CEPA considered this issue with the updated sample, they found while the average asset beta for gas is higher than for electricity, the difference between the two estimates is not statistically significant given the large variance of the gas estimates.

[179] Commerce Commission "Input methodologies review decisions - Topic paper 4: Cost of capital issues (20 December 2016), paras 367.1 and 367.2.

4.134 Oxera for Vector, First Gas and Powerco found the difference in asset beta between gas and electricity sub-samples using updated data is 0.07 but the results are not statistically significant.[180]

4.135 The asset betas for our gas subsample are shown in the following table.

Table 4.3 Asset betas for the gas subsample, by period and frequency

	2007-2012	2012-2017	2017-2022
Daily	0.44	0.49	0.50
Weekly	0.40	0.48	0.50
Four-weekly	0.38	0.43	0.48

4.136 We have updated the statistical analysis for our proposed comparator set. We have tested the null hypothesis that the mean of the gas sample is not significantly different to the mean of the non-gas sample for different periods. The results are shown below.

Table 4.4 Results of test of whether there is a statistically significant difference between the means of the gas and non-gas samples (p-values, debt beta = 0)[181]

	2007-12	2012-17	2017-22	2018-20	2020-22	2021-22
Daily	0.219	0.019*	0.040*	0.002**	0.182	0.250
Weekly	0.329	0.024*	0.120	0.002**	0.387	0.320
Four-weekly	0.342	0.029*	0.164	0.012*	0.223	0.953

[180] Oxera "Asset beta and WACC percentile for New Zealand GDBs" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for First Gas, PowerCo and Vector, 1 February 2023), p. 23.

[181] The values reported in this table are p-values. A p-value is a measure of evidence against the null hypothesis. In this case, the null hypothesis is that there is no significant difference between the means of the gas and non-gas samples. A single asterisk indicates there is evidence against the null hypothesis at the 0.05 level of significance; two asterisks indicate evidence at the 0.01 level of significance; three asterisks indicate evidence at the 0.001 level of significance. The more asterisks there are, the more confidence can be placed on a conclusion that the gas sample can be separated from the non-gas sample. It is common practice to use at least one asterisk as the level of evidence required to be confident that the means of two samples are statistically different. These results are generated using the t.test function in the package R.

4.137 At the 2016 IM Review we noted that a non-zero debt beta assumption makes comparisons of asset betas across individual firms more valid because it accounts for different levels of gearing.[182] However, our analysis at the time indicated that the addition of a non-zero debt assumption largely changed the level of the asset beta for each subsample considered, and not the relativity of the asset betas across the different subsamples.[183] We repeated our statistical testing using an illustrative debt beta of 0.1. The results, shown in the table below, indicate that including a debt beta assumption in the analysis does not change the results.

4.138 For the statistical testing in this review, we have assumed a zero debt beta when calculating the asset beta for individual firms.

Table 4.5 Results of test of whether there is a statistically significant difference between the means of the gas and non-gas samples (p-values, debt beta = 0.1)

	2007-12	2012-17	2017-22	2018-20	2020-22	2021-22
Daily	0.216	0.018*	0.041*	0.002**	0.186	0.253
Weekly	0.324	0.023*	0.120	0.002**	0.390	0.322
Four -weekly	0.337	0.029*	0.164	0.012*	0.224	0.932

4.138.2 We can reject the null hypothesis for the pre-COVID-19 periods of 2012-2017 and 2018-2020 but not for the period 2007-2012. That is, there is evidence of a statistically significant difference in the means for the pre-COVID-19 period from 2012 to 2020.

4.138.3 We cannot reject the null hypothesis for the 2017-2022 period which includes the COVID-19 period (although the daily data is significant for this period), but neither can we reject the null hypothesis for the 1 October 2021 to 30 September 2022 period.

4.139 We have noticed the results are sensitive to the inclusion of a gas firm (ONEOK Inc) which has a relatively high asset beta variability. If that firm is excluded from the analysis, the conclusion of a statistically significant difference in the means for the pre-COVID-19 period is weaker, with the weekly and four-weekly results becoming insignificant at the 0.05 level of significance for the periods other than 2018-20.

[182] Commerce Commission "Input methodologies review decisions – Topic paper 4: Cost of capital issues (20 December 2016), para 383.

[183] A comparison of Figure 7, which shows the asset betas of the subsamples assuming a zero debt beta, and Figure 8, which is the same chart assuming a non-zero debt beta, indicates the figures are very similar with the difference is mainly due to a shift in the levels of the asset betas. See Commerce Commission "Input methodologies review decisions - Topic paper 4: Cost of capital issues (20 December 2016), pp. 95 and 99.

Table 4.6 Results of test of whether there is a statistically significant difference between the means of the gas and non-gas samples (p-values) excluding ONEOK

	2007-12	2012-17	2017-22	2018-20	2020-22	2021-22
Daily	0.305	0.040*	0.051	0.001**	0.372	0.399
Weekly	0.462	0.051	0.196	0.002**	0.915	0.486
Four-weekly	0.510	0.062	0.313	0.020*	0.443	0.813

4.140 We also note that the asset betas for the gas sample are less reliable than for the full sample. The average variation by asset beta by frequency for the gas subsample is 0.13 and for the full sample is 0.07; the bid-ask spread is 0.10% for the gas subsample and 0.07% for the full sample.

4.141 We have concluded that the statistical testing does not provide sufficient reason to separate the gas and non-gas samples. However, this is a finely balanced issue, and the argument could be made for separating the samples. We are concerned about the reliability of the gas data, which weakens the case for separation, and note that the post-COVID-19 data does not support separation, although that data is over a relatively short timeframe.

4.142 Appendix B includes the results of further statistical testing, which includes the finding that the results are similar when the comparison is between the gas sample and the electricity sample (rather than the non-gas sample which includes integrated firms). We also find that there is no statistically significant difference between the electricity and non-electricity samples.

4.143 We also note the two Australian energy network regulators that have just finished their periodical WACC reviews did not distinguish between gas and electricity in their comparator samples or provide an uplift for gas.

4.143.1 The AER used a limited domestic sample and did not limit it further by restricting it to gas businesses[184]; and

[184] The AER decided on an equity beta of 0.6 and leverage of 0.6. The implied asset beta is 0.24. See AER "Rate of Return Instrument" (February 2023).

4.143.2 The ERA's international sample is very similar to CEPA's (the main difference is that the ERA includes companies from Canada [185]); they did not limit the sample to gas businesses even though they were making a decision on gas pipelines.[186]

4.144 Ofgem is another regulator that does not calculate a separate asset beta for gas.[187]

4.145 Overall, our view is that there is insufficient reason to create separate samples for gas and electricity.

Providing an uplift to the asset beta for gas

4.146 This section considers the issue of whether the systematic risk of New Zealand gas companies is different to the sample set due to specific characteristics of the New Zealand gas sector.

4.147 The submitters that support a gas uplift include:

4.147.1 First Gas, which submits the uplift should revert to 0.10 because there has now been 16 years when the average betas for gas have been higher than for electricity. They also noted our previous reasoning on income elasticity of demand and the relatively low penetration of gas connections in New Zealand;[188]

4.147.2 Powerco, which noted the CEPA findings, our previous reasoning and the Oxera report.[189] Oxera concluded on theoretical grounds (higher elasticity of demand, lower gas penetration rates) that gas has a higher systematic risk which supports an uplift; and

4.147.3 Vector, as they consider there is a risk of under-investment in the gas network during the energy transition.[190]

4.148 The submitters that do not support a gas uplift include:

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[185] The reason we have not included Canadian firms in this review is to maintain consistency with the sampling method we used in the 2016 review. Two of the eight Canadian firms in the ERA's sample are predominantly gas utilities.

[186] The ERA decided on an equity beta of 0.7 and leverage of 0.55. The implied asset beta is 0.315. See Economic Regulation Authority "2022 final gas rate of return instrument" (16 December 2022).

[187] Ofgem "RIIO-ED2 Draft Determinations – Finance Annex" (29 June 2022), para 3.33.

[188] First Gas Group "Submission on IM Review CEPA report on cost of capital" (3 February 2023), pp. 1-3.

[189] Powerco "Submission on IM Review CEPA report on cost of capital" (3 February 2023), p. 5.

[190] Vector "Submission on IM Review CEPA report on cost of capital" (3 February 2023), p. 3 and paras 25 to 28. Vector "Submission on IM Review CEPA report on cost of capital" (3 February 2023), p. 3 and paras 25 to 28.

4.148.1 Aurora Energy; however, they recommend this issue be reconsidered once the Oxera recommendation to remove unsuitable firms from the sample is completed;[191]

4.148.2 ENA, but did not provide reasons[192]; and

4.148.3 Major Gas Users Group, due to the statistical evidence from CEPA and they also consider the asset beta appears to favour New Zealand electricity suppliers (they consider Vector's asset beta has been lower than the asset beta used in the energy sector by more than the uplift).[193]

4.149 Overall, our reason for providing an uplift in 2016 still stands and there are no new reasons provided in submissions.

Conclusion on gas uplift

4.150 While the updated statistical analysis does not necessarily justify separating the gas sample, the results are finely balanced. We also continue to consider that gas is likely to have a higher income elasticity and that the gas networks in New Zealand may face a higher risk than gas networks overseas due to the lower rates of connection in New Zealand. Overall, we consider that an uplift should be provided.

4.151 We have considered whether 0.05 is an appropriate magnitude for the uplift. We note that the average value of asset beta of the gas subsample for the last two five-year periods is 0.47, and that we are proposing a value of 0.35 for the energy beta. That difference, at 0.12, is higher than the 0.05 current uplift.

4.152 However, we also note that if we exclude the gas firm with high asset beta variability (ONEOK Inc) from the analysis, the asset beta for the gas subsample is 0.43, which reduces the difference to 0.08. In comparison, the asset beta for the non-gas sample is 0.33 (using the average of the weekly and four-weekly asset betas for the last two five-year periods).

4.153 We also note that the average leverage of the gas sample (excluding ONEOK Inc) is 37% compared to the 41% for the energy sample. In comparison, if we:

4.153.1 apply a 0.1 uplift and change the leverage assumption to 37%, the GPB equity beta would be 0.71; and

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[191] Aurora Energy "Submission on IM Review CEPA report on cost of capital" (3 February 2023), paras 19-20. Aurora Energy "Submission on IM Review CEPA report on cost of capital" (3 February 2023), paras 19-20.

[192] Electricity Networks Association (ENA) - Rate of return issues -"Submission on IM Review CEPA report on cost of capital" (3 February 2023), p. 12. Electricity Networks Association (ENA) - Rate of return issues - "Submission on IM Review CEPA report on cost of capital" (3 February 2023), p. 12.

[193] Major Gas Users Group "Submission on IM Review CEPA report on cost of capital" (3 February 2023), paras 5 and 19-23.

4.153.2 continue to apply a 0.05 uplift and do not change the leverage assumption, the GPB equity beta would be 0.68.

4.154 This analysis indicates that, even if we do take into account the higher average asset beta in the gas subsample, there is not a strong reason to change the uplift from 0.05.

4.155 We propose to maintain an asset beta uplift of 0.05 for the GPBs with the leverage that applies to the GPBs calculated from the full energy sample.

New evidence for step 6: calculating the equity beta

4.156 The equity beta is calculated using the asset beta and notional leverage.

4.157 We propose applying the same notional leverage to EDBs, Transpower and GPBs. As explained in paragraphs 5.5 to 5.15, we are proposing to apply a leverage of 41%, which is lower than the 42% calculated in 2016 (and compares to CEPA's calculation of 39%).

4.158 For EDBs and Transpower, an asset beta of 0.35 combined with notional leverage of 41% results in an equity beta of 0.59. This compares to 0.60 in the current IMs, and CEPA's estimate of 0.57.

4.159 For GPBs, an asset beta of 0.40 combined with notional leverage of 41% results in an equity beta of 0.68. This compares to 0.69 in the current IMs, and CEPA's estimate of 0.66.

Tax adjusted market risk premium

Summary of draft decision

4.160 We propose to use a TAMRP of 7%. This is the same as our final decision in 2016, although the TAMRP for GPBs was subsequently amended to 7.5%.[194]

4.161 We further propose that where we determine a WACC for PQ purposes, that a TAMRP of 7% be used for four- and five-year PQ paths.

[194] Commerce Commission "Input methodologies review decisions. Topic paper 4: Cost of capital issues" (20 December 2016; Commerce Commission "Amendments to input methodologies for gas pipeline businesses related to the 2022 default price-quality paths weighted average cost of capital Reasons paper" (25 March 2022), para 3.4.

Our reasons for proposing a TAMRP of 7%

4.162 Setting a TAMRP at our best estimate gives best effect to the s 52A purpose of the Act. We consider that this should be expected to adequately compensate investors (in combination with the other elements of the cost of capital) but still limit the ability to extract excessive profits.

4.163 Our best estimate of the TAMRP is 7%. This estimate:

4.163.1 best reflects the range of evidence available, including both historical returns and expected future returns. These are described in greater detail below and combine forward-looking and backward-looking estimates; and

4.163.2 is consistent with the range of TAMRP estimates used by New Zealand market participants, including New Zealand investment banks.

Tax adjusted market risk premium

4.164 The MRP measures the additional expected return over and above the risk-free rate required to compensate investors for holding the market portfolio. It represents the premium investors can expect to earn for bearing systematic (market) risk. The form of the MRP that is consistent with the SBL-CAPM is the TAMRP.

4.165 The TAMRP applied in the SBL-CAPM utilises a tax adjustment to the standard MRP to take into account the treatment of taxes in New Zealand.[195] The TAMRP is neither a regulated provider-specific parameter nor an industry-specific parameter, but rather is common to all assets in the economy.

4.166 In this paper, data relating to MRP estimates has been converted to the TAMRP equivalent. In the interest of brevity, the term 'TAMRP' is used in the text that follows except where there is specific reference to an MRP value.

4.167 The TAMRP is not directly observable and therefore needs to be estimated. This is because:

4.167.1 the TAMRP is a forward-looking concept that reflects investors' expectations;

4.167.2 market returns show what happened, not what was expected; and

[195] The standard version of the CAPM assumes that all sources of investment income are equally taxed at the personal level. This is not a good description of the New Zealand tax regime, because both capital gains and dividends are less onerously taxed than interest (the favourable treatment of capital gains tax is due to exemption of many investors and, in respect of the rest, the opportunity for deferring payment until sale of the asset. The favourable treatment of dividends arises from dividend imputation). Consequently, it is common practice in New Zealand to invoke a CAPM that recognises the favourable tax treatment of equity returns.

4.167.3 the market portfolio itself cannot be observed as market values for many assets are not known, so it requires the use of a proxy (eg, returns on an index of listed equities).

4.168 The TAMRP is also calculated using an estimate of the risk-free rate. When we estimate the TAMRP we need to specify the term of the risk-free rate. We have assumed a term for the risk-free rate which matches the regulatory period.

Relevance of the Commission's previous estimates of TAMRP

4.169 TAMRP, by definition, is an economy-wide parameter which should not vary by sector, service or company. As discussed below, TAMRPs are also expected to be relatively stable over time. Given this we consider our previous decisions promoting the outcomes in s 52A of the Act to provide useful insights when estimating the TAMRP that best give effect to the Part 4 objectives.

4.170 The table below shows the historic series of our estimates of the TAMRP.

Table 4.7 Estimates of the TAMRP used by the Commission.

Decision	Year of Decision	TAMRP Estimate
Airports Inquiry[196]	2002	8%
Telecommunications Service Obligations (TSO) determinations - 2001-2002	2003	8%
TSO determinations - 2002-2003 onwards	2005-2008	7%
Gas Control Inquiry[197]	2004	7%
Unison Networks Limited (Unison) Post-breach Inquiry[198]	2007	7%
Gas Authorisation[199]	2008	7%
IMs relating to the supply of electricity distribution services and gas pipeline services[200]	2010	7%
IMs relating to the supply of electricity transmission services[201]	2010	7.5% until June 2011; 7% thereafter

[196] Commerce Commission "Final Report: Part IV Inquiry into Airfield Activities at Auckland, Wellington and Christchurch International Airports" (1 August 2002).

[197] Commerce Commission "Gas Control Inquiry: Final Report" (29 November 2004).

[198] Commerce Commission "*Regulation of Electricity Lines Businesses – Targeted Control Regime – Reasons for Not Declaring Control – Unison Networks Limited*" (11 May 2007), pp. 38-39.

[199] Commerce Commission, "*Gas Authorisation Decisions Paper"* (30 October 2008).

[200] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010).

[201] Commerce Commission "Input methodologies (Transpower) reasons paper" (22 December 2010).

IMs relating to the supply of specified airport services, [202]	2010	7.5% until June 2011; 7% thereafter
UCLL & UBA FPP[203]	2015	7%
Review of the IMs determined under Part 4[204]	2016	7%
Fibre IMs[205] (Also used in the gas DPP3[206])	2020	7.5%

Estimating the TAMRP

4.171 In the Process and issues paper we raised the possibility of using 7.5% as the TAMRP for all businesses regulated under Part 4, although we also indicated that we would consider how often the TAMRP should be estimated.[207] Since we published the Process and issues paper, interest rates have increased and so we considered it prudent to re-estimate the TAMRP for the present review.

4.172 The TAMRP is a forward-looking concept which cannot be directly observed.

4.173 Estimating the value of the TAMRP requires a significant amount of judgement. As discussed below there are a range of expert views on matters that are relevant to the estimation of the TAMRP and there is no single approach that provides a correct estimate.

4.174 Several approaches can be used to estimate the TAMRP. These approaches include:

4.174.1 studies of historic returns on shares relative to the risk-free rate;

4.174.2 surveys of investors asking them to state their expected rate of return for the overall market; and

4.174.3 empirical estimates of the MRP from share prices and expected dividends.

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[202] Commerce Commission "Input methodologies (Airport Services) reasons paper" (22 December 2010).

[203] Commerce Commission "Cost of capital for the UCLL and UBA pricing reviews: Final Decision" (15 December 2015).

[204] Commerce Commission "Input methodologies review decision – Topic Paper 4: Cost of capital issues" (20 December 2016).

[205] Commerce Commission "Fibre input methodologies: Main final decisions – reasons paper" (13 October 2020), from page 441, para 6.521.

[206] Commerce Commission "Amendments to input methodologies for gas pipeline businesses related to the 2022 default price-quality paths – weighted average cost of capital – Reasons paper" (25 March 2022), pp. 13-15, paras 3.9 – 3.22, n 173.

[207] Commerce Commission "Part 4 Input Methodologies Review 2023: Process and issues paper" (20 May 2022), pp. 103- 105, paras 6.45 – 6.58.

4.175 In estimating the value of the TAMRP, we used all three of the above approaches by considering the following methods and information sources:

4.175.1 The Ibbotson approach which uses data from 1931 to estimate the TAMRP.[208] A critique of this approach is that it fails to correct for pronounced unanticipated inflation between 1926 to 1990.

4.175.2 The Siegel estimates attempt to adjust for this effect. The Siegel 1 methodology, which adjusts the Ibbotson approach on the underlying assumption that TAMRP is stable over time by adding back into the estimation the average long-term real risk-free rate.[209]

4.175.3 The Siegel 2 methodology, which adjusts the Ibbotson approach on the underlying assumption that real total market returns are constant. The two Siegel methodologies can give quite different results due to these quite distinct underlying assumptions.[210]

4.175.4 Surveys of investors' views on TAMRP, which are based on the Fernandez annual survey.[211] We have also considered available estimates from practitioners in New Zealand as a cross check.

4.175.5 The dividend growth model (**DGM**), which is a forward-looking methodology. This estimates the TAMRP through discounting future dividends on existing shares to the current market value of those shares.

4.176 The most common approach to estimation of the TAMRP is to use historic returns on the market. While ex-post returns have fluctuated significantly over time, regulators and practitioners have typically used or placed weight on estimates over long periods of time.[212]

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[208] Lally "Estimation of the TAMRP" (report to the Commerce Commission, 10 April 2023), pp. 4-10.

[209] Ibid, pp. 10-18.

[210] Ibid, pp. 10-18.

[211] Fernandez, Pablo, Diego García de la Garza, and Javier Fernández Acín "Survey: Market Risk Premium and Risk-Free Rate used for 80 countries in 2023" (April 3, 2023).

[212] Conceptually, over the long term, the occasions on which the premium of actual returns over the risk-free rate exceeds investors' expectations should be offset by the occasions on which that premium is below investors' expectations. The average premium will therefore provide an estimate of the premium that on average investors look for.

4.177 There is debate as to whether historical premiums are accurate predictors of future premiums. A number of prominent finance experts have argued that future rates of return will be less than that experienced historically.[213]

4.178 Similarly, forward-looking estimates from the DGM approach are not without controversy.

4.178.1 The AER, in its 2018 and 2022 binding rate of return guidelines, down weighted the reliance on DGM models (compared to its 2013 guidelines). One reason for this was because the AER did not consider that the evidence it reviewed supported the assumption of a stable return on equity (eg, that there was an inverse relationship between the risk-free rate and MRP).[214]

4.178.2 UK regulators have used DGM models; however, they have typically been given less weight and have been used predominately as a cross check to the approach they have placed most weight on.[215]

4.178.3 Surveys of investors can provide an indication of the premium that investors will look for in the future. However, surveys can be unreliable as respondents can, for example, interpret questions in different ways.

4.178.4 We consider that there is no one best way to estimate TAMRP and this is consistent with advice from Dr Lally. For our final decision we have considered all information before us in reaching a judgement on the best estimate of TAMRP.

Term of the risk-free rate used in estimating the TAMRP

4.179 The risk-free rate features in three places in the cost of capital calculation. It is explicitly part of both the cost of debt and the cost of equity. In addition, the risk-free rate is also part of the estimation of the TAMRP (which measures, as outlined above, the additional expected return over and above the risk-free rate required to compensate investors for holding the market portfolio).

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[213] See for example, see Dimson, E., March P. and Staunton M., "Triumph of the Optimists: 101 Years of Global Investment Returns", Princeton University Press, New Jersey, 2002; Dimson, E., March P. and Staunton M., Global Evidence on the Equity Risk Premium, Journal of Applied Corporate Finance, Vol. 14, 2003, pp. 27-38; and Arnott, R. and Bernstein P., What Risk Premium is 'Normal'?, Financial Analysts Journal, Vol. 58, No. 2, March/April 2002, pp. 64-85; Credit Suisse 2012 Global Investment returns yearbook.

[214] Australian Energy Regulator "Rate of Return Explanatory Statement" (December 2018), p. 221; and Australian Energy Regulator "Rate of Return Explanatory Statement" (February 2023), p. 17.

[215] Ofgem "RIIO-2 Final Determinations – Finance Annex (REVISED)" (03 February 2021), p. 166.

4.180 Under s 53M of the Act, a regulatory period must be five years. However, we may set a shorter period if doing so better meets the purpose of the Act, however the period must not be shorter than four years. Consequently, we considered estimates consistent with a four- and five-year period. As we have found, when rounded to the nearest 0.5%, the TAMRP estimate does not vary between four- and five-year potential terms, and so a single rate for TAMRP is appropriate for all WACC determinations for Part 4.

The evidence which leads us to our decision of a TAMRP of 7.0%

4.181 The evidence from forward-looking, historic, and survey results of TAMRP support an estimation of the TAMRP at 7.0%.

4.182 We commissioned Dr Lally to estimate the TAMRP and have published his expert report alongside this paper. Dr Lally's estimate of the TAMRP is 7.0%. The estimate is based on the median of five different methods as shown in Table 4.8, rounded to the nearest 0.5%.

Table 4.8 Estimates of the TAMRP with a Five-Year Risk-Free Rate

	New Zealand	Other Markets[216]
Ibbotson estimate	7.4%	7.5%
Siegel estimate: version 1	6.0%	6.5%
Siegel estimate: version 2	7.7%	6.7%
DGM estimate	5.3%	6.7%
Surveys	7.1%	7.1%
Median	7.1%	6.7%

4.183 Dr Lally also estimated the TAMRP for us in 2010, 2015, and 2019. Those estimates, with the new estimates for 2023, are shown in Table 4.9.

[216] We take account of other markets because Lally and Randal (2015) examine estimators of the MRP and show that the optimal estimator for a country should place high weight on foreign data. The estimates using only local data are very noisy and the true MRPs do not vary greatly across countries.

Table 4.9 TAMRP estimates by Dr Lally for 2010, 2015, 2019, and 2023

	2010			2015		2019		2023	
	NZ	US	Other	NZ	Other	NZ	Other	NZ	Other
Ibbotson estimate	7.3%	7.7%	7.5%	7.1%	7.0%	7.4%	7.3%	7.4%	7.5%
Siegel estimate: Version 1	6.4%	7.3%	6.6%	5.9%	5.9%	6.0%	6.6%	6.0%	6.5%
Siegel estimate: Version 2	6.4%	7.3%	6.6%	8.0%	7.5%	9.4%	8.3%	7.7%	6.7%
DGM/Cornell*	5.2%	6.8%	-	7.4%	9.0%	7.3%	8.2%	5.3%	6.7%
Surveys	8.2%	6.9%	-	6.8%	6.3%	6.4%	6.6%	7.1%	7.1%
Mean	6.8%	7.2%	7.1%	7.0%	7.1%	7.3%	7.4%	6.7%	6.9%
Median	6.9%	7.1%	7.1%	7.1%	7.0%	7.3%	7.3%	7.1%	6.7%
Rounded to 50bps	7.0%			7.0%[217]		7.5%		7.0%	

*Cornell used in 2010, DGM in 2015, 2019, 2023

[217] Dr Lally's advice notes that the correction of the error in the Ibbotson error for 2015 does not change the estimated TAMRP at that time, Martin Lally, "Estimation of the TAMRP" (September 2019), n 2.

Table 4.10 TAMRP estimates used by major New Zealand investment banks

Investment bank	TAMRP estimate
Craigs Investment Partners	6.50%
Forsyth Barr	5.50%
Jarden	7.00% and 7.25%*
Macquarie	7.50%
UBS	7.00%

***Jarden use 7% company-wide and for Vector, but 7.25% for AIAL**.

4.184 As further evidence on the appropriate TAMRP, we have also collated investment banks' and analysts' views to better understand what estimates of TAMRP are used in the market. The table above provides the results of this survey which range from 5.5% to 7.5%. The results are not inconsistent with a TAMRP of 7.0%.

Issues relating to the TAMRP

4.185 We received submissions on the TAMRP in response to the Process and issues paper and in response to the consultation on CEPA's report on aspects of the cost of capital.

4.186 In the Process and issues paper, we raised the possibility of using 7.5% for all businesses regulated under Part 4 as we did for Fibre in 2020 and for GPBs in 2022. Views on the suggestion we might use 7.5% have been superseded by the decision to re-estimate the TAMRP.

4.187 We discuss below points raised in submissions as they relate to:

4.187.1 the models that we use to estimate the TAMRP;

4.187.2 our approach of rounding to the nearest 0.5%; and

4.187.3 when we estimate the TAMRP.

4.188 In each case, our draft decision is to continue to use the approach described above which we used in the 2016 IM Review and in setting the Fibre IMs in 2020.

We propose continuing to use five models to estimate the TAMRP

4.189 Our draft decision is to continue using the five models described above to estimate the TAMRP.

4.190 Chorus and IEC (writing for Chorus) suggest that we should switch to using a total market return (**TMR**) approach to estimating the TAMRP.[218] Under a TMR, the return on the market portfolio is assumed to be constant, and the MRP varies as the interest changes. They argue for a TMR approach on the basis that it would make the WACC more stable.

4.191 In the context of our models, a TMR approach would be closest to putting full weight on the Siegel 2 and DGM models.

4.192 Oxera (writing for the 'Big 6' EDBs) suggest that we place greater weight on approaches that assume a negative relationship between interest rates and the return on the market (effectively a TMR approach), less weight on fixed-TAMRP approaches, and decrease the weight that we place on surveys.

4.193 TDB Advisory (writing for BARNZ) submitted in support of our approach of using multiple models to estimate the TAMRP.[219]

We propose maintaining our approach of rounding TAMRP to the nearest 50 basis points

4.194 We have considered and accept the advice we have previously received from Dr Lally on rounding the TAMRP estimate to the nearest 50 bps.

4.195 Dr Lally laid out his rationale in full in a report to the Queensland Competition Authority which he refers to in his papers.[220] He considers that the rounding has little impact on the accuracy of the estimation measured through the standard error. However, its value impact will incentivise submissions advocating an increase (or decrease) which adds to administrative burden. Over time the small over- and under-estimations implicit (but essentially unobservable) in a TAMRP rounded to the nearest 50bps will net out. In this respect it is not error in any one regulatory period which matters, but error over the life of the assets.

4.196 We agree that the estimation of TAMRP is inherently subject to error and trying to refine to below 50bps is likely futile. Furthermore, the technical nature of the estimation leaves open a very wide range of areas to be 'tweaked' to produce a higher or lower estimate which, given the value to regulated providers, may generate large amounts of expert views with little benefit to end-users.

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[218] Chorus "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), p. 4, para 12(b); and Chorus "Measures to improve the stability in WACC estimates" (11 July 2022), pp. 4 and 13 – 27, sections 1.3 and 3.

[219] TDB Advisory "Process and Issues and draft Framework papers" (report prepared for Board of Airline Representatives New Zealand Inc., 11 July 2022), p. 3, section 2.2.

[220] Lally "The risk-free rate and the market risk premium" (23 August 2012).

4.197 In submissions and cross-submissions on the Process and issues paper, Air New Zealand and TDB Advisory (writing for BARNZ) argued that we should use the unrounded median.[221] TDB Advisory suggested that if we continue to round, that we should round to the nearest 0.25%.

4.198 NZAA support the suggestion of using 7.5% and oppose TDB Advisory's suggestion that the TAMRP be rounded to the nearest 0.25%.[222] Christchurch International Airport supports rounding.[223]

4.199 Aurora Energy, Christchurch Airport, the ENA, First Gas, and Vector made submissions in support of our suggestion of using 7.5% as the TAMRP.[224] That value was arrived at by rounding the 7.3% to the nearest 0.5%.

4.200 Oxera (for the 'Big 6' EDBs) suggest that we reassess our approach to rounding, noting that it is out of line with the AER's approach of rounding to the nearest 0.1% and Ofgem's approach of rounding to the nearest 0.25%.[225]

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[221] Air New Zealand "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), p. 2; and TDB Advisory "Process and Issues and draft Framework papers" (report prepared for Board of Airline Representatives New Zealand Inc., 11 July 2022), p. 5.

[222] NZ Airports Association "Cross-submission on IM Review process and issues paper, and draft framework paper" (3 August 2022), pp. 5-6, paras 23-24.

[223] Christchurch International Airport Ltd "Cross-submission on IM Review process and issues paper and, draft framework paper" (3 August 2022), p. 2, para 8.

[224] Aurora Energy "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), para 57; Aurora Energy "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), para 57; Christchurch International Airport Ltd "Cross-submission on IM Review process and issues paper and, draft framework paper" (3 August 2022), para 8; Electricity Networks Association "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), p. 14; First Gas Limited "Submission on IM Review Process and Issues paper and draft Framework paper" (13 July 2022), p. 24; and Vector "Cross-submission on IM Review process and issues paper, and draft framework paper" (3 August 2022), para 58., p. 14; First Gas Limited "Submission on IM Review Process and Issues paper and draft Framework paper" (13 July 2022), p. 24; and Vector "Cross-submission on IM Review process and issues paper, and draft framework paper" (3 August 2022), para 58.

[225] Oxera "Review of the NZ Commission's WACC setting methodology" 'Submission on IM Review CEPA report on cost of capital' (report prepared for 'Big EDBs, 3 February 2023),p. 25.

4.201 We have previously considered arguments for not rounding the TAMRP, most recently in setting the Fibre IMs.[226] We have received no new arguments for changing our approach to rounding the median estimate, and so propose to continue doing so. Overall, a move away from rounding does not appear to better give effect to the Part 4 purpose statement. We consider that rounding the TAMRP provides regulated suppliers with certainty without any erosion of investment incentives and is likely to reduce the need to frequently re-estimate the TAMRP. Estimating the TAMRP to a high level of accuracy is not practically achievable, and estimation errors will generally cancel out over the lives of the assets.

Our draft decision is to specify the value of TAMRP within the IMs

4.202 We consider there is an insufficient case for changing our TAMRP estimate on a regular basis. This is similar to the practice of many advisers who do not regularly change their estimate of the TAMRP. As noted, our ability to discern small movements in the TAMRP is limited.

4.203 We consider it better meets the purpose of the IMs in s 52R to promote certainty to specify a value within the IMs. As discussed below this does not preclude the TAMRP from being amended in the IMs between our statutory reviews if this is warranted by the particular circumstances.

4.204 In a submission on the Process and issues paper, First Gas suggested that we estimate the TAMRP as part of each DPP setting process, and if that is too onerous, to estimate the TAMRP as part of the annual WACC determinations.[227]

4.205 The trade-off of more frequent estimations would be increased volatility and uncertainty compared with a value set in the IMs and most likely only provide marginal benefits in accuracy given the inherent uncertainty of the estimate.

4.206 Our estimates of the market risk premium have been relatively stable over a long period of time. There are likely to be short term changes to the TAMRP with changes in the economic environment. However, these movements may not reflect the value expected to prevail over the period until the IMs are next reviewed.

4.207 If there are significant changes in the economic environment, we are able to make changes to the TAMRP value in the IMs (although this would not take effect until the subsequent regulatory period after the change has been implemented).

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[226] Commerce Commission "Fibre input methodologies: Main final decisions – reasons paper" (October 2020), paras 6.558-6.570.

[227] First Gas Limited "Submission on IM Review Process and Issues paper and draft Framework paper" (13 July 2022), p. 24.

4.208 Overall, it is not clear that a move to more frequent estimation would better promote the Part 4 purpose. We consider that setting the TAMRP in the IMs promotes certainty for regulated suppliers and consumers without eroding incentives for investment. Therefore, we maintain our decision to specify the value of TAMRP within the IMs.

Equity issuance costs

4.209 Our draft decision is to maintain our current approach of not including an equity issuance cost allowance.

4.210 We considered whether to allow for equity issuance costs when we established the IMs in 2010[228], when we reviewed the IMs in 2016[229], and in establishing the Fibre IMs in 2020.[230]

4.211 In general, we do not consider that an allowance for equity issuance costs is required. We note that:

4.211.1 equity capital is normally available in perpetuity and does not need refinancing;

4.211.2 each company chooses what proportion of its profits it will retain in the businesses. Retaining profits can be used to finance growth in the asset base without incurring issuance costs; and

4.211.3 in general, given the characteristics of regulated providers, their ownership, and their capacity to contribute additional equity, there is no evidence of a material issue regarding equity raising costs.

4.212 However, our draft decision to apply inflation indexation to Transpower's RAB may result in Transpower needing to increase its equity using funds beyond the amounts available in retained earnings and dividends. We will await submissions on our draft decision before considering this matter further.

Submitters' views on equity issuance costs

4.213 Unison suggested including an allowance for capital raising costs within the IMs:[231]

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[228] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), p. 462.

[229] Commerce Commission "Input methodologies review decisions – Topic paper 4: Cost of capital issues" (December 2016), pp. 139-140.

[230] Commerce Commission "Fibre input methodologies: Main final decisions – reasons paper" (October 2020), p. 458.

[231] Unison – "Submission on IM Review Process and issues paper and draft Framework paper" (11 July 2022), para 44.

EDBs and Transpower may need to seek additional equity funding to keep pace with the extent of investment required to enable customers to decarbonise. There is currently no explicit allowance for capital raising costs within the WACC IM, which may be inconsistent with the principle of achieving an expectation of real FCM.

4.214 Wellington Electricity supported Unison's suggestion of including an allowance for equity issuance costs:[232]

the increasing investment programmes (driven by the ERP) will mean that networks are likely to have to raise additional equity as they approach their debt lending limits.

4.215 ENA and CEG (on behalf of ENA) submitted on CEPA consultation and suggested that we should include in our financial model an allowance for equity raising costs.[233]

4.216 CEG presented modelling for Aurora Energy, Orion, Unison, Vector and Wellington Electricity showing that over the next five years, if they pay out 63% of pre-tax income as dividends, and maintain a leverage of 42%, they will all need to raise equity capital.[234]

4.217 However, we note that the five networks for which CEG presents evidence are expected to generate cashflow returns to equity that are large enough to meet their equity financing needs while maintaining the target leverage ratio.[235]

4.218 As ENA and CEG recognised, retained earnings are cheaper than dividend reinvestment programmes. For a firm to pay dividends, and then incur the cost of raising new equity through more expensive means is not efficient.

4.219 Therefore, we consider that there is no reason to provide an allowance for equity issuance costs for the EDBs. However, we are aware that capex associated with electrification of the economy may lead to equity raising costs being incurred in the future. We welcome any further evidence on the likelihood that equity raising costs will be incurred and the materiality of these costs. We particularly welcome submissions on whether our draft decision to apply inflation indexation to Transpower's RAB will likely result in Transpower incurring equity issuance costs.

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[232] Wellington Electricity "Cross-submission on IM Review process and issues paper, and draft framework paper" (10 August 2022), p. 5.

[233] Electricity Networks Association (ENA) - Rate of return issues -"Submission on IM Review CEPA report on cost of capital" (3 February 2023), pp. 20-21.

[234] CEG "Estimating the WACC under the IMs" 'Appendix C -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, February 2023), p. 40.

[235] The sum of 'Dividend at Assumed Payout Ratio' and 'Retained Cashflow Available for Reinvestment under Assumed Payout Ratio' is greater than the 'Equity' component.

Chapter 5 Other WACC parameters

Purpose of this chapter

5.1 This chapter discusses our draft decisions for the parameters that do not comfortably sit in either the cost of debt or cost of equity chapters.

Structure of this chapter

5.2 This chapter begins by explaining why we propose to maintain our current approach to estimating a notional leverage, which includes a discussion of the leverage anomaly associated with the use of the SBL-CAPM.

5.3 We then discuss the tax rates we propose to use in our WACC estimates.

5.4 Finally, we discuss our proposed approach to determining updated estimates of the standard error of the WACC.

Leverage

5.5 We propose maintaining our 2016 approach to estimating notional leverage, which is to use the average leverage of our asset beta comparator samples. This results in leverage of 41% for EDBs, GPBs and Transpower, and 26% for airports. In comparison, in the 2016 IMs we determined notional leverage of 42% for EDBs, GPBs and Transpower, and 19% for airports.

5.6 Leverage refers to the mix of debt and equity capital that is used to fund an investment. It is used in two places when estimating the cost of capital. The first is to convert the equity beta into an asset beta (and vice versa). The second is to derive a WACC by weighting the estimates of the cost of debt and the cost of equity.

Submissions

5.7 In relation to leverage, Oxera's report for the Major Electricity Users Group (**MEUG**) recommended we review the comparator sample to only include firms that are similar to the New Zealand networks, that we should consider placing more weight on the recent two to five-year periods, and that we should align the period over which leverage and betas are assessed.[236]

5.8 CEG's report for the ENA noted that setting the benchmark leverage equal to the sample average leverage avoids the need for estimating a debt beta.[237]

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[236] Oxera "Review of NZCC's WACC-setting methodology" (report prepared for Aurora, Orion, Unison, Vector, Wellington Electricity, 31 January 2022), section 6.1.3 and conclusion at p. 61.

[237] Electricity Networks Association (ENA) - Rate of return issues -"Submission on IM Review CEPA report on cost of capital" (3 February 2023), p. 14.

Our considerations

5.9 We estimate notional leverage by calculating the average leverage of our comparator sample. We do this because we use the SBL-CAPM, which accounts for the absence of capital gains tax in New Zealand but has an anomaly. For a given level of systematic risk, and consideration of tax costs, an increase in leverage is not expected to change the WACC. That is, the effects of leverage on converting the asset beta to an equity beta exactly offsets the effects of leverage on changing the weight between the costs of equity and debt. However, the SBL- CAPM results in the WACC increasing when leverage increases because the increase in the equity beta more than offsets the lower weight to the cost of equity.

5.10 One way of dealing with this anomaly would be to use a debt beta when converting the asset beta to equity beta. An alternative, which is what we do, is to assume the financial risk of the benchmark firm is the same as the average financial risk of the comparator sample. In making this assumption, we avoid the complexity of converting asset betas to equity betas when notional leverage differs from the notional leverage of the comparator sample. This was discussed in more detail in our 2010 IMs.[238]

5.11 As noted above, CEG's report for the ENA acknowledged that our method of estimating leverage using the average of the comparator sample is appropriate, and we have not received other submissions on this matter.

5.12 In relation to Oxera's report for the MEUG, we agree that we should align the period over which leverage and betas are assessed. However, the COVID-19 pandemic has caused us to re-examine whether we should continue to set asset betas by using the two last five-year periods. We have decided to use our judgement in determining asset betas by considering pre-COVID-19 as well as post-COVID-19 information, because we do not know the extent that COVID-19 was a systematic event.

5.13 The implication is that we also need to use judgement in determining an estimate of leverage. The following table shows the estimates of leverage for the energy comparator sample over different periods.

Table 5.1 Estimates of leverage for the energy comparator sample, by period

	2007-12	2012-17	2017-22	2018-20	2020-22	2021-22
Leverage	0.44	0.40	0.41	0.38	0.42	0.41

[238] Commerce Commission "Input Methodologies (Electricity distribution and Gas pipeline services) reasons paper" (December 2010), paras 6.6.4 - 6.6.16.

5.14 For energy, our estimate of the pre-COVID-19 leverage (which uses the 2007-2012, 2012-2017 and 2018-2020 periods) is 0.42. In comparison the estimate of leverage for 2020-2022 is 0.42 and for 2021-2022 is 0.41. The average of the last two five-year periods is also 0.41.

5.15 We consider that 0.41 is the best estimate of leverage for the energy suppliers for the period of the IMs and is consistent with our judgement for the average asset beta from our comparator sample. As leverage has been trending down since 2007 we consider that we should not put much weight on the 2007-2012 data. We note that the COVID-19 period does not appear to have had much effect on leverage. We also note that 0.41 is the average leverage of the last two five-year periods and of the last year.

5.16 The following table shows the estimates of leverage for the airports comparator sample over different periods.

Table 5.2 Estimates of leverage for the airports comparator sample, by period

	2007-12	2012-17	2017-22	2018-20	2020-22	2021-22
Leverage	0.36	0.28	0.24	0.20	0.28	0.28

5.17 Our estimate of the pre-COVID-19 leverage (which uses the 2007-2012, 2012-2017 and 2018-2020 periods) is 0.30. In comparison the estimate of leverage for 2018-2020 is 0.20 and for 2021-2022 is 0.28. The average of the last two five-year periods is 0.26.

5.18 We consider that 0.26 is the best estimate of leverage for airports and is consistent with our judgment for the average asset beta from our comparator sample. As with energy, we consider this data indicates leverage has decreased since 2007 and that we should not put much weight on the 2007-2012 data.[239] We note that the COVID-19 period may have increased leverage; however, leverage was lower in the pre-COVID-19 period of 2018-2020. In the circumstances, we consider the estimate of 0.26 accounts for the decline in leverage during the pre-COVID-19 periods as well as the 2021-2022 estimate that indicates leverage may have increased as a result of COVID-19.

Tax

5.19 This section explains that we do not propose to change our current approach to the corporate and investor tax rates used in estimating WACC.

[239] At the 2016 IM Review we used a larger sample to estimate leverage of 19%. For this draft decision we are using a smaller sample, so the 19% estimate is not comparable to the 26% estimate for this draft decision.

Corporate tax rate

5.20 We propose to maintain the approach of using the statutory corporate tax rate when estimating the WACC. The current statutory corporate tax rate is 28%.

5.21 By linking to the statutory corporate tax rate, the IMs continue to allow any future changes in tax rates to flow through to the calculation of the WACC.

Investor tax rate

5.22 We propose to maintain the approach of using an investor tax rate that reflects the maximum prescribed investor rate under the Portfolio Investment Entity (**PIE**) regime, which is currently 28%. The investor tax rate is the average marginal personal tax rate across all investors in the economy.

5.23 Under the PIE regime, individuals are able to limit their tax liability on interest earned to a maximum of the corporate tax rate. We acknowledge that there is a range of statutory tax rates for interest earned by individuals depending on their total taxable income. Using the maximum prescribed PIE rate is a useful proxy for estimating the average investor tax, which we note has little effect on the final allowed rate of return.

5.24 The IM does not provide for the tax circumstances of individual investors. We consider that using tax rates in the IMs that are reflective of those actually used by suppliers is consistent with achieving an appropriate estimate of WACC.

Standard error of the WACC

5.25 This section discusses our proposed approach to determining updated estimates of the standard error of the WACC. The standard error of the WACC is used to calculate different WACC percentile estimates, for example:[240]

5.25.1 for EDBs and Transpower the standard error is used to calculate the 65th percentile WACC estimates used for PQ path regulation;

5.25.2 for GPBs, we propose to publish the standard error of the WACC; and

5.25.3 for airports, we propose to publish the standard error of the WACC, enabling interested parties to generate a distribution for our WACC estimates.

5.26 Based on the analysis we have undertaken, we propose to:

5.26.1 maintain the standard error of the WACC for EDBs/Transpower at 0.0101;

[240] We assume that the WACC is normally distributed. Therefore, different WACC percentiles can be estimated using the relevant z-scores, our mid-point WACC estimate, and the standard error of the WACC.

5.26.2 maintain the standard error of the WACC for GPBs at 0.0105; but

5.26.3 change the standard error of the WACC for airports to 0.0153.

5.27 The proposed change in the standard error of the WACC mainly involves revising our estimates of the standard error of the asset beta based on updated data for the comparator samples used when determining asset beta and leverage.

Approach to estimating the standard error of the WACC

5.28 Under the current IMs, we combine standard errors for the asset beta, debt premium and TAMRP to determine an overall standard error of the WACC. We propose to maintain the 'complex analytical approach' to calculate the standard error of the WACC.[241]

5.29 For the complex analytical approach, we use the following formula to estimate the standard error of the WACC by combining the standard error estimates of each parameter:

$$\sqrt{var(\widehat{TAMRP})var(\widehat{B_a}) + E^2(\widehat{TAMRP})var(\widehat{B_a}) + E^2(\widehat{B_a})var(\widehat{TAMRP}) + (1-T_c)^2\left[var(\hat{p})var(\hat{L}) + E^2(\hat{p})var(\hat{L}) + E^2(\hat{L})var(\hat{p})\right]}$$

Where:

$var(\widehat{TAMRP})$ is the square of the standard error of the estimated TAMRP;

$E^2(\widehat{TAMRP})$ is the square of the estimated TAMRP;

$var(\widehat{B_a})$ is the square of the standard error of the asset beta;

$E^2(\widehat{B_a})$ is the square of the estimated asset beta;

T_c is the corporate tax rate;

$var(\hat{p})$ is the square of the standard error of the debt premium;

$E^2(\hat{p})$ is the square of the estimated debt premium;

$var(\hat{L})$ is the square of the standard error of leverage; and

$E^2(\hat{L})$ is the square of leverage.

5.30 The standard errors we determined in the 2016 IMs are shown in Table 5.3.

[241] For a detailed description of 'complex analytical approach', see Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) Reasons paper" (December 2010), para H11.19.

Table 5.3 Standard errors of the WACC determined in the 2016 IM Review

	EDBs and Transpower	GPBs	Airports
Standard error of the asset beta	0.12	0.12	0.16
Standard error of the TAMRP	0.015	0.015	0.015
Standard error of the debt premium	0.0015	0.0015	0.0015
Standard error of overall WACC	0.0101	0.0105	0.0146

5.31 All parameters other than the TAMRP, debt premium, and asset beta are assumed to have a standard error of zero for the reasons we lay out below:

5.31.1 **Leverage**: to address the leverage anomaly we use a notional leverage estimate based on the average leverage of our comparator firms. This is to make the cost of capital invariant to changes in leverage (as the equity beta and leverage are calculated using the sample of comparator firms rather than independently). Applying a standard error would undermine this purpose.

5.31.2 **Risk-free rate**: the risk-free rate does vary, however, there is only very small uncertainty as to what the rate actually is at any one time. Variations in the risk-free rate can be hedged by regulated providers. That is, a standard error associated with the risk-free rate plays no purpose in measuring uncertainty associated with our estimate in the cost of capital.

5.31.3 **Debt issuance costs and tax rates**: we consider that these parameters are not associated with significant levels of uncertainty.

5.32 This leaves the standard errors associated with estimating the debt premium, TAMRP and asset beta. We will explain each of them in the following sections.

Submitters' views on standard error for leverage

5.33 Vector suggest including a standard error of the leverage:[242]

> The Commission calculates the standard error of the WACC considering only three parameters (the TAMRP, debt premium and asset beta). This assumes the other parameters of the WACC can be known with any certainty. However, this is not the case for notional leverage, the risk-free rate or debt issuance costs. For example, the optimal leverage for EDBs may not be correct. The standard error for leverage may be material as the Commission uses a large and diverse set of comparators which is likely to include companies with very different leverages in the estimate. Although the Commission compares its estimates of the mid-point WACC with independent third parties, it doesn't compare the estimates it could generate through applying alternative methodologies. This differs from the approach taken by other regulators which consider a range of parameter values. Not considering alternative sources of evidence will tend to lead to an under-estimate of the allowed point estimate within the range.

5.34 We maintain our view that leverage should have a standard error of zero. As explained in paragraph 5.31.1 above, due to the anomaly associated with the simplified SBL-CAPM, we apply a notional leverage estimate based on the average leverage of our comparator sample. This notional level of leverage is necessary to make the cost of capital invariant to changes in leverage (as the equity beta and leverage are calculated using the sample of comparator firms rather than independently). If we were to assume a non-zero estimate for the standard error for leverage, the estimate of the cost of capital would vary with leverage. This would contradict the reason we apply notional leverage.

Standard error of the asset beta

5.35 When we estimate the asset beta of the regulated providers from our comparator sample set, this provides a standard error associated with the asset beta estimate. From these standard errors and the individual estimates of the asset betas of comparators we can derive the standard error for the overall asset beta estimate using the methodology laid out by Dr Lally in 2008.[243]

Updated standard error of the asset beta

5.36 We have undertaken updated analysis of the standard error of the asset beta, based on our comparator samples used to estimate asset beta and leverage. Based on this analysis, we have determined that:

5.36.1 a standard error of the asset beta of 0.12 should apply to EDBs, Transpower, and GPBs;

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[242] Vector "Submission on IM Review CEPA report on cost of capital" (3 February 2023), p 11.

[243] We followed the approach set out in Lally (2008) to estimate the standard error of the asset beta. Martin Lally "The weighted average cost of capital for gas pipeline businesses" 28 October 2008, Appendix 3, pp. 170-178.

5.36.2 a standard error of the asset beta of 0.18 should apply to airports; and

5.36.3 data on the standard error of the asset beta for the energy comparator sample is summarised in Table 5.4.

Table 5.4 Standard error of the asset beta for updated energy comparator sample

	2007-2012	2012-2017	2018-2020	Average
Weekly	0.11	0.14	0.12	0.12
Four-weekly	0.11	0.11	0.14	0.12
Average	0.11	0.12	0.13	0.12

5.37 When we estimate the asset beta, we use judgement because we do not know the extent that COVID-19 was a systematic event. Our asset beta estimate is broadly consistent with the pre-COVID-19 long-term average weekly and four-weekly estimates. For the purpose of calculating the standard error of the asset beta we have used the 12 years prior to COVID-19, consisting of two five-year periods (2007-2012, 2012-2017) and one two-year period (2018-2020). We apply a weight of 5/12, 5/12 and 2/12 to the three periods, and average over-estimation frequencies and time periods, which leads to a standard error of the asset beta of 0.12 (rounded to two decimal places).

5.38 We have determined that the updated standard error of the asset beta of 0.12 should apply to EDBs, Transpower and GPBs. This estimate is the same as in our 2016 IMs.

5.39 We also assessed updated data on the standard error of the asset beta for the airports comparator sample, as summarised in Table 5.5. Averaging across the weekly and four-weekly estimates for the three pre-COVID-19 periods results in a standard error of the asset beta for airports of 0.18. This is a slight increase from our 2016 IMs standard error for airports of 0.16.

Table 5.5 Standard error of the asset beta for updated airports comparator sample

	2007-2012	2012-2017	2018-2020	Average
Weekly	0.13	0.28	0.18	0.20
Four-weekly	0.08	0.26	0.10	0.15
Average	0.11	0.27	0.14	0.18

Standard error of the TAMRP

5.40 The TAMRP is a difficult parameter to estimate and is subject to substantial potential error. In 2008 Dr Lally estimated the standard error associated with the TAMRP at 0.015.[244] We used the estimate of 0.015 in the 2010 IMs, 2016 IM Review and 2020 Fibre IMs.

5.41 In light of no further evidence, our draft decision is to maintain a 0.015 estimate of the standard error for the TAMRP.

Standard error of the debt premium

5.42 In 2016 IM Review, we determined that a fixed standard error of the debt premium of 0.0015 should apply. This is because this parameter has very little impact on the standard error of the overall WACC.[245]

5.43 In the absence of further evidence, our draft decision is to maintain a fixed standard error of the debt premium of 0.0015 as in the 2016 IM Review.

Draft review regarding overall standard error of the WACC

5.44 Based on the analysis described above, our draft decision is that the standard errors in Table 5.6 should apply.

Table 5.6 Updated standard errors of the WACC under this draft determination

	EDBs and Transpower	GPBs	Airports
Standard error of the asset beta	0.12	0.12	0.18
Standard error of the TAMRP	0.015	0.015	0.015
Standard error of the debt premium	0.0015	0.0015	0.0015
Standard error of overall WACC[246]	0.0101	0.0105	0.0153

[244] See Lally "The Weighted Average Cost of Capital for Gas Pipeline Businesses" (October 2008), Appendix 2.

[245] Commerce Commission "Input methodologies review decisions – Topic paper 4: Cost of capital issues" (20 December 2016), paras 596-602.

[246] We noted that while the formula for calculating the standard error of the overall WACC differs slightly for vanilla and post-tax WACC estimates, in both cases the values are 0.0101 (for EDBs/Transpower), 0.0105 (for GPBs), and 0.0153 (for airports) when rounded to four decimal places.

Application of the standard error of the WACC for airports

5.45 We propose to maintain our 2016 IM Review approach to publish our mid-point estimate of the cost of capital together with the standard error of the WACC for airports. The standard error can be used to determine the probability distribution of the WACC estimate and any additional WACC percentile required.

Chapter 6 Additional cost of capital issues

Purpose of this chapter

6.1 This chapter explains our draft decisions in respect of the main identified cost of capital issues for the review that do not fit neatly into the cost of debt or the cost of equity chapters above. The issues considered in this chapter are:

6.1.1 the appropriate WACC percentile;

6.1.2 adjusting the EDB and Transpower IMs to allow for a WACC for a four-year regulatory period for EDBs, DPPs, and Transpower's Individual Price-quality Paths (**IPPs**); and

6.1.3 a split cost of capital.

The appropriate WACC percentile

Purpose and context

6.2 This section explains the reasons for our draft decisions:

6.2.1 to use the 65th percentile of the WACC for PQ regulation of EDBs and Transpower, and the 50th percentile (mid-point) of the WACC for PQ regulation of GPBs; and

6.2.2 to publish for the purposes of ID regulation: the 25th, 50th, 65th, and 75th percentile of the WACC for EDBs and Transpower; the 25th, 50th, and 75th percentile of the WACC for GPBs; and the 50th percentile and standard error of the WACC for airports.

Approach to considering an uplift for the WACC

Summary of our draft decision

6.3 Having considered the evidence and weighed up how best to give effect to the s 52A purposes of the Act, our draft decision is to use the 65th percentile of the WACC for PQ regulation of EDBs and Transpower, and the 50th percentile (mid-point) of the WACC for PQ regulation of GPBs. In addition to the 50th percentile we will continue to publish the 25th, 65th, and 75th percentiles of WACC for the purposes of ID regulation for EDBs and Transpower, the 25th and 75th percentile for GPBs, and the standard error of the WACC for airports.

Rationale for providing an uplift

6.4 In setting the WACC percentile, we balance limbs (a) and (d) of the Part 4 purpose statement. The purpose statement requires that suppliers of regulated goods or services:

6.4.1 s 52A(1)(a): have incentives to innovate and to invest, including in replacement, upgraded, and new assets; and

6.4.2 s 52A(1)(d): are limited in their ability to extract excessive profits.

6.5 We also consider the promotion of the outcomes in s 52A(1)(b) and (c).

6.6 The WACC that we determine is an estimate of the true cost of capital of the businesses that we regulate. If we determine a WACC at the true cost of capital, we balance limbs (a) and (d): businesses will have an incentive to invest but will be limited in their ability to earn excessive profits.

6.7 The midpoint WACC is our best, unbiased estimate of the true cost of capital of the businesses we regulate.[247] However:

6.7.1 our estimate of the WACC is uncertain and we cannot observe whether we have set the WACC too high or too low; and

6.7.2 there may be an asymmetry between the costs and benefits of setting the WACC too high versus setting it too low.

6.8 Specifically, if we set the WACC below the cost of capital, whilst regulated businesses will be limited in their ability to earn excessive profits, they may under-invest. If the under-investment goes undetected and is allowed to accumulate over time, it may result in outages. If we set the WACC above the cost of capital then regulated businesses may over-invest where the cost of such over-investment would outweigh the benefits to consumers, and so regulated businesses will earn above-normal returns at the expense of consumers.

6.9 This leads to a possible asymmetry in the costs of setting the WACC too high versus setting the WACC too low. Setting the WACC too high is expensive for consumers because they pay higher bills. However, setting the WACC too low may result in even higher costs for consumers if it leads to outages.

6.10 Considering the asymmetric consequences of over- and under-investment over the long term is one of the economic principles that we use as a guide to best promote the part 4 purpose. This economic principle recognises the trade-off between the higher costs to consumers of promoting investments with the expected benefits of reducing the risks of under-investment (such as improved quality, including reduced risk of large-scale supply outages).[248]

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[247] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services Reasons paper" (30 October 2014), paras 4.25-4.26.

[248] We considered these issues in the Commerce Commission "Part 4 Input Methodologies Review 2023: Framework paper" (13 October 2023), p. 51, paras 4.20-4.23.

6.11 In this section we consider the appropriate WACC percentile for PQ regulation of EDBs, Transpower and GPBs against the concern that there may be an asymmetry between the costs of setting the WACC above the true cost of capital versus setting the WACC below the true cost of capital.

6.12 A WACC uplift (percentile above the 50th) is expensive for consumers because it directly increases consumer bills. It is also poorly targeted in the sense that the higher bills paid by consumers cannot be linked directly either to increased investment in reliability or to improvements in reliability. Nonetheless, we consider that where warranted, an uplift is one of the tools that we consider appropriate to mitigate the risks of underinvestment.[249]

6.13 Outages from an unreliable network are expensive for consumers and remediating an unreliable network is likely to take some time. Because of this, we consider that a WACC uplift is one of the tools that we can use to incentivise businesses to maintain their network.

6.14 In 2014 we considered that investments could be broadly categorised into investments in quality, demand growth, innovation, and economic investments. We discuss these in paragraph 6.37 below. While we considered that it may be appropriate to incentivise investments in quality (reliability) using an ex-ante mechanism, we considered that investments in innovation, economic investments with a positive net benefit for consumers, and investments to meet demand growth are generally better incentivised by targeted mechanisms that reward businesses for achieving pre-defined targets.

Background to the current uplift

6.15 In setting the original IMs in 2010, we decided to use the 75th percentile for the WACC for PQ regulation of EDBs, Transpower, and GPBs.

6.16 Following the High Court appeal and criticisms of the lack of an empirical basis for choosing the 75th percentile, we undertook further work in 2014.

6.17 We collected a considerable amount of evidence as part of our review. The evidence included:[250]

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[249] Note, for example, that we did not consider that an uplift was warranted in the case of Fibre.

[250] In addition to papers and reports cited elsewhere in this reasons paper: Franks "Memorandum" (20 June 2014), Dobbs "Proposed amendment to the WACC percentile for the Allowed Rate of Return: Comments on the Application of the Dobbs [2011] model" (17 September 2014), Lally "The Appropriate Percentile for the WACC estimate" (report to the Commerce Commission, 19 June 2014), Economics Insights "Regulatory Precedents for Setting the WACC within a Range" (11 October 2014), Dobbs "Modelling Welfare Loss Asymmetries Arising from Uncertainty in the Regulatory Cost of Finance" Journal of Regulatory Finance 39 (12 October 2010), pp. 1-28.

6.17.1 relevant academic literature, notably a 2011 paper by Professor Ian Dobbs regarding welfare loss asymmetries arising from uncertainty in the WACC;

6.17.2 independent reports prepared by our expert advisors: Oxera, Professor Ingo Vogelsang, Professor Julian Franks, Dr Martin Lally, Economic Insights, and Professor Dobbs; and

6.17.3 expert reports submitted on behalf of interested parties in response to our draft decision and other consultation papers we released.

6.18 As part of that work, Oxera developed a loss analysis model that allowed us to compare the costs in higher consumer bills that result from setting the WACC above the midpoint to the benefits of the expected costs of outages avoided.

6.19 As a result of that further work, in 2014 we decided to use the 67th percentile of the WACC for EDBs, Transpower, and GPBs. In arriving at the decision to reduce the percentile from the 75th percentile, we placed greatest reliance on:[251]

6.19.1 the results of the loss analysis model developed for us by Oxera; and

6.19.2 an analysis of RAB multiples.

6.20 We also gave weight to the views of independent expert advisors and the fact that comparable overseas regulators often adopted WACCs above the midpoint.[252]

6.21 However, we also found it was not possible to define a specific percentile based purely on empirical evidence given the fundamental uncertainty on key relationships. For example, it is extremely difficult to estimate empirically the link between the WACC allowed by the regulator, the level of investment by regulated suppliers, and how this affects quality of service. In reaching our final decision, we exercised judgement in picking a point between the 60th and 75th percentile to balance the relative costs and benefits to consumers.[253]

[251] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services Reasons paper" (30 October 2014), para 6.41.

[252] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services Reasons paper" (30 October 2014), para 5.84.

[253] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services Reasons paper" (30 October 2014), para 6.413.

6.22 We concluded that the main reason to set a WACC percentile above the mid-point is to mitigate the risk of under-investment relating to service quality generally and contributing to major supply outages in particular. However, compared to setting the WACC at the mid-point, a WACC uplift should also reduce the risk of under-investment in other types of investment.[254]

6.23 In 2020 we decided to use the mid-point WACC for Fibre. In reaching that decision, we applied the loss analysis model and the reasoning that we developed in 2014 to the factual context of regulated fibre services and the objectives of Part 6 of the Telecommunications Act.

Stakeholder views

The appropriate percentile

6.24 The analysis of the appropriate percentile incorporates substantive points raised in:

6.24.1 submissions and cross-submissions on the Process and issues paper;

6.24.2 CEPA's report for the Commission;

6.24.3 submissions received in response to a consultation process based on CEPA's report;[255] and

6.24.4 CEPA's response to submissions received in response to the consultation process based on their report.[256]

6.25 CEPA provided us with an update of Oxera's (2014) report. While they do not draw conclusions about the WACC percentile that we should target, they note that there are two key changes in their update that pull in different directions:

6.25.1 Their update of the loss analysis model points to an optimal percentile between the 68th and 83rd for electricity. Although CEPA note that they consider that their cost of outages may be too high, in which case the optimal percentile is lower than the range that their results suggest.[257] The details are discussed in the analysis section.

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[254] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services Reasons paper" (30 October 2014), para X18.

[255] We received expert reports from CEPA (for the Commission), CEG (for the ENA), Oxera (for the 'Big 6' EDBs, and for Vector, First Gas, and Powerco), and Frontier (for Transpower). Most individual submissions from suppliers rely on their expert reports.

[256] CEPA "Review of Cost of Capital 2022/ 2023: response to submissions" (report to the Commerce Commission, 15 May 2023).

[257] CEPA "Report on Cost of Capital 2022/ 2023" (report to the Commerce Commission 'IM Review 2023' (29 November 2022), section 4.6; CEPA "Review of Cost of Capital 2022/ 2023: response to submissions" (report to the Commerce Commission, 15 May 2023), p. 5 and section 2.5.

6.25.2 Their update of international regulatory precedent points to more regulators considering whether to use WACCs above the mid-point and then choosing to aim at the mid-point.[258]

6.26 Stakeholder views on the appropriate percentile can be summarised as:

6.26.1 the Major Electricity Users' Group (**MEUG**) and Major Gas Users Group (**MGUG**) support the 50th percentile (mid-point).

6.26.2 suppliers support the 67th percentile as a minimum but argue for higher. From the expert reports commissioned by suppliers:

6.26.2.1 Oxera writing for the 'Big 6' EDBs support the 70th percentile as the midpoint of the range from the 65th to 75th. They note that the current 67th percentile is within their preferred range;[259]

6.26.2.2 Oxera writing for Vector, First Gas, and Powerco support retaining at least the 67th percentile;[260] and

6.26.2.3 CEG writing for the ENA support the 79th percentile from a range of 75th to 84th.[261]

6.26.2.4 Frontier writing for Transpower support at least the 80th percentile out of the 80th, 90th, or 95th.[262]

6.27 The main difference between consumer groups and suppliers is the evidence that they emphasise.

6.28 Suppliers and experts writing for suppliers emphasise:

6.28.1 Estimates of the optimal percentile that results from updating our loss analysis model, including CEPA's update for us.

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[258] CEPA "Report on Cost of Capital 2022/ 2023" (report to the Commerce Commission 'IM Review 2023' (29 November 2022), table 4.3.1, p. 27.

[259] Oxera "Review of the percentile of WACC distribution" -'Submission on IM Review CEPA reports (report prepared for 'Big 6 EDBs', 31 January 2023), p. 44.

[260] Oxera "Asset beta and WACC percentile for New Zealand GDBs" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for First Gas, PowerCo and Vector, 1 February 2023), p. 50.

[261] CEG "Memorandum: Updating the 2014 WACC Percentile" 'Appendix B -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, 26 January 2023), p. 1.

[262] Frontier Economics "Response to CEPA WACC report" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for Transpower, 1 February 2023), para 2 (a), p. 4.

6.28.2 The expected increase in investment associated with decarbonisation.[263]

6.28.3 That EDBs have earned returns below our expected levels.[264]

6.29 In supporting the 50th percentile, consumer groups emphasise a wider range of types of evidence.

6.29.1 The MEUG point to:[265]

6.29.1.1 a shift in regulatory precedent towards midpoint WACCs;

6.29.1.2 the loss analysis model considers only current-year nominal variables, and so ignores dynamic effects;

6.29.1.3 our estimate of the costs of outages is too high. Major outages have multifactorial causes. In estimating the optimal percentile, we assign all the benefits from avoiding outages to investment in distribution and transmission;

6.29.1.4 it would be difficult for the hypothesised prolonged under-investment to take place given that we: (i) evaluate our regulatory settings and rules at least every seven years, and (ii) scrutinize asset management plans (**AMPs**) of regulated suppliers;

6.29.1.5 all parts of the economy face climate change and decarbonisation risks. We should rely on market signals (sector asset betas) to capture the effect of climate and decarbonisation risks;

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[263] CEG "Memorandum: Updating the 2014 WACC Percentile" 'Appendix B -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, 26 January 2023), para 2 and 8; Ibid, pp. 16-40; Frontier Economics "Response to CEPA WACC report" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for Transpower, 1 February 2023), pp. 17-19, paras 52-65; Oxera "Oxera "Review of the percentile of the WACC distribution that should be targeted by the NZCC" (report prepared for 'Big Six EDBs', 31 January 2023), section 5.2 pp. 39-41; Oxera "Asset beta and WACC percentile for New Zealand GDBs" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for First Gas, PowerCo and Vector, 1 February 2023), paras 4.16 and 4.65-4.73.

[264] Oxera "Review of the percentile of the WACC distribution that should be targeted by the NZCC" (report prepared for 'Big Six EDBs', 31 January 2023), p. 33. We note that this is not an issue with the level of the WACC: see Commerce Commission "Part 4 Input methodologies Review 2023 - Draft decision - Financing and incentivising efficient expenditure during the energy transition topic paper" (14 June 2023), chapter 5b for a discussion of the impact of inflation on returns.

[265] Points 6.29.1.1 - 6.29.1.5 are from Major Electricity Users Group "Submission on IM Review CEPA report on cost of capital" (10 February 2023), pp. 2-5; points 6.29.1.6 and 6.29.1.7 are from Major Electricity Users Group "Submission on IM Review Process and Issues paper" (11 July 2022), para 7 - 8.

6.29.1.6 the cost of the uplift is quantifiable, and we should provide evidence of the magnitude of the benefits; and

6.29.1.7 that we should consider alternative mechanisms, such as accelerated depreciation or an uplift only where a business has made a case for it. The burden of demonstrating the need for anything beyond a midpoint WACC should fall to the supplier of the regulated service.

6.29.2 MGUG point to:[266]

6.29.2.1 a shift in regulatory precedent towards midpoint WACCs, including the AER's view that any uplift is arbitrary and will lead to less efficient outcomes than the mid-point;

6.29.2.2 the asymmetric risk of under-investment for major gas users is moderated by the option of switching to other energy sources (liquefied petroleum gas (**LPG**) or electricity); but also

6.29.2.3 that the Climate Change Commission has estimated that it will cost gas users $5.3 billion to transition to other sources of energy;[267] and

6.29.2.4 that while Powerco has expressed concerns over policy uncertainty impacting the economics of infrastructure investment, Vector and First Gas's asset management plans do not support the view that GPBs are either underinvesting or planning to curtail investment.

How we arrived at our proposed percentiles

The starting point for our review

6.30 As we noted earlier, we gathered a great deal of evidence during our 2014 review and enhanced our understanding of the issues. Consequently, we are not starting these considerations afresh but building on the existing evidence base.[268]

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[266] Major Gas Users Group "Submission on IM Review CEPA report on cost of capital" (3 February 2023), para 6; "Major Gas Users Group "Cross-submission on IM Review process and issues paper, and draft framework paper" (3 August 2022), p. 5, para 21-28.

[267] Major Gas Users Group "Cross-submission on IM Review process and issues paper, and draft framework paper" (3 August 2022), p. 4, para 18; Ministry for Business Innovation and Employment "Managing the phase out of fossil gas and opportunities to repurpose infrastructure for renewable gases: report back and proposed next steps" (9 June 2022), p. 20, para 147.

[268] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services Reasons paper" (30 October 2014).

6.31 This evidence base was both qualitative and quantitative and we have sought to update both. To this end we commissioned CEPA to refresh the quantitative model we used in 2014 and provide an update on international regulatory practice. We have reconsidered evidence on RAB multiples as well as other evidence on the reasonableness of our WACC estimates, and we have considered the decarbonisation context looking forward. We have also given consideration to other respects in which our overall regulatory regime has changed, including monitoring of assets, the introduction of a quality incentive scheme for EDBs, and the fact that we have taken enforcement action over breaches of quality standards.

The appropriate percentile for regulated electricity lines companies

6.32 As part of this review, we have reconsidered the main reasoning and evidence behind our 2014 decision and asked whether this has changed. This has included:

6.32.1 the potential impact of de-carbonisation;

6.32.2 the incentives to investment, including the quality incentives scheme for EDBs;

6.32.3 our improved ability to monitor and address quality issues;

6.32.4 the updated results of the loss analysis model;

6.32.5 evidence from our reasonableness checks; and

6.32.6 decisions made by comparable international regulators.

6.33 Our draft decision is to use the 65th percentile for the purposes of PQ regulation for EDBs and Transpower. In reaching this draft decision we have considered:

6.33.1 The evidence from the loss model suggests a range between the 55th and 75th percentile. The 65th percentile is the mid-point of this range.

6.33.2 Our reasonableness checks also point to there having been no investment problem under the current 67th percentile. Our updated parameters produce commercially realistic WACCs at the 65th percentile.

6.33.3 In 2014 there was a tendency for comparable international regulators to use a percentile above the 50th. CEPA's update of the evidence points to more regulators aiming to the mid-point than was the case in in 2014.

6.33.4 We introduced a quality incentive scheme for EDBs in 2014. The scheme rewards EDBs for exceeding quality standards and rewards them for exceeding them.

6.33.5 We have taken enforcement action against regulated suppliers for breaching quality standards. In 2014 this was a possibility. We have now undertaken such action,

6.33.6 Improvements in summary and analysis, and information disclosure more generally, mitigate the risk of sustained under-investment going unnoticed. Because we have better information, we can take more targeted measures to address shortfalls in investments in reliability, and less reliance is needed on setting a WACC percentile above the mid-point. However, we are also aware that the likely increased reliance on electricity for the economy may make the cost of outages greater.

The potential impact of de-carbonisation

6.34 Suppliers asked us in 2014, and again in the present review, to expand the scope of the benefits that are considered in estimating the appropriate percentile. They argue that where possible future investments offer positive net benefits to consumers, and the investments might not take place without an uplift, that we should consider the net benefit of that investment.[269]

6.35 In the present review, the arguments for a wider purpose for the percentile have been made specifically with respect to decarbonisation, the increased electrification of the economy, and the expanded role of EDBs in managing a smart network. While some of the arguments do relate to reliability, there are also arguments for expanding the scope of benefits that we consider in assessing the appropriate percentile.[270]

6.36 While recognising the importance of these investments, and the need for greater investment than has taken place in the recent past, we consider that the WACC percentile is the wrong tool to incentivise these types of investments except to the extent that they relate to the expected costs of outages.

6.37 In 2014 we identified four categories of investment:[271]

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[269] Our argument for the limited purpose of the WACC uplift is set out in paragraphs 3.36-3.44 and 5.79-5.83 of the 2014 Reasons paper. We consider the specific types of investment—in network quality, to meet demand growth, in innovations, and economic investments—in paras 5.53-5.77 (Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services: Reasons paper" (30 October 2014), paras 3.36-3.44, 5.79-5.83, and 89-95).

[270] Vector "2023 Cost of Capital consultation" (30 March 2023), paras 9-10; CEG "Updating the 2014 WACC percentile" (report prepared for the ENA, October 2022), section 3; Frontier Economics "Response to CEPA WACC report" (report prepared for Transpower, 01 February 2023) paras 23-28; Oxera "Review of the percentile of the WACC distribution that should be targeted by the NZCC" (report prepared for Aurora, Orion, Powerco, Unison, Vector, Wellington Electricity, 31 January 2023), section 5.2.

[271] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services - Reasons paper" (30 October 2014), para 3.37.

6.37.1 Quality: investments to provide services at the quality consumers demand, which could include investments to maintain service quality (including aspects of resilience to the reliability of service), and investments to improve service quality;

6.37.2 Demand growth: investments to meet current and future consumer demand for regulated services, which could include increased demand from existing consumers, and increased demand due to new consumers;

6.37.3 Innovation: innovation investments, in either regulated services or related unregulated services; and

6.37.4 Economic investments: investments that have a positive net benefit to consumers of regulated services, and/or to the wider economy (eg, investments to reduce transmission grid congestion and that enhance competition in generation).

6.38 As noted, in 2014 several submissions from regulated suppliers have suggested that a WACC uplift should be used to avoid the risk that, without the uplift, specific investments with a positive net benefit to consumers would not occur.[272] In their view this is particularly the case for certain innovation investments, economic investments, and for investments to meet new demand. According to these submissions, we should be concerned about investments 'at the margin' and ensure that positive incentives are in place to stimulate such investments. In the present review, equivalent requests have been made with respect to decarbonisation.

6.39 We are mindful that a WACC uplift will apply to the entire RAB, and not just to any incremental investment that is expected to not otherwise occur without the WACC uplift. With a WACC uplift consumers pay a significant ex-ante 'premium', in the form of higher prices over the long term, to mitigate the risk of under-investment.[273]

6.40 Consequently, we recognise there is a risk that consumers pay the premium due to the WACC uplift but:

6.40.1 the WACC uplift makes little or no difference to marginal investment incentives and future investment levels; or

[272] See for example CEG "Updating the 2014 WACC percentile" (October 2022), section 6, noting para 112.

[273] See Ingo Vogelsang "Review of New Zealand Commerce Commission 'Proposed amendment to the WACC percentile for electricity lines services and gas pipeline services' paper published on July 22, 2014" (report to the Commerce Commission, 31 July 2014), para 14; Ingo Vogelsang "Reply to Comments on my June 12, 2014, paper 'On the economic effects of allowing a WACC above the mid-point'" (report to the Commerce Commission, 20 October 2014), para 14.

6.40.2 the incremental investment occurs, but that investment makes little or no difference to the likelihood that future costs are avoided (eg, the costs of major supply outages); or

6.40.3 more generally, the incremental investment occurs, but over time the benefits to consumers do not equal, let alone exceed, the costs of the uplift through higher prices.

6.41 To the extent that any additional positive incentives to actively promote greater investment might be justified, we consider that targeted ex-post investment incentive mechanisms (involving rewards and/or penalties that affect allowable revenue) are likely to be more effective for some types of investment than an ex-ante WACC uplift. This is because, with a targeted ex-post investment incentive mechanism:

6.41.1 any rewards or penalties can be specifically linked to a particular benefit/outcome having occurred, or to the investment that is expected to result in that benefit/outcome occurring;

6.41.2 the scheme would not require consumers paying a premium through higher prices without those benefits (or investments) necessarily occurring; and

6.41.3 because the premium relates to the marginal investment/benefit (rather the entire RAB), in circumstances where the expected benefit arises (or the investment occurs) it would be a more cost-effective way of delivering that benefit than a WACC uplift.

6.42 On the other hand, a targeted ex-post incentive scheme is likely to have limitations in avoiding major supply outages because:

6.42.1 it is difficult to link an effective reward mechanism to the avoidance of a major outage occurring;

6.42.2 where an ex-post penalty is applied, the cost to consumers will have already been incurred once any penalty takes effect;

6.42.3 it can be difficult to determine the liability for an outage, whether the outage was due to negligence, or what prudent actions the supplier should have taken to mitigate the risk and impact of the outage; and

6.42.4 any ex-post penalty would potentially be very large, but the level at which the penalty can realistically be set is likely to be significantly lower than the cost incurred by consumers due to the outage.

6.43 Therefore, the main reason we have set a WACC uplift is to mitigate against the risk of under-investment relating to service quality generally and contributing to major supply outages in particular. However, higher WACC may incentivise greater investments of all kinds, and compared to setting the WACC at the mid-point, a WACC uplift should also reduce the risk of under-investment in other types of investment as well.

6.44 We also note that since we decided to use the 67th percentile of the WACC, we have introduced a quality incentive scheme for EDBs.[274] Under the scheme, EDBs are rewarded when they exceed pre-determined quality standards and are penalised when they fall short of them. While there is an overlap between the intent of the WACC uplift and the quality incentive scheme, we do not consider that the quality incentive scheme may not be sufficient to mitigate the risks of under-investment.

6.45 In addition, where investments yield cost savings, in addition to the ex-ante expectation of earning the WACC as a return on these investments, suppliers will also benefit under the existing incentive scheme.[275]

6.46 The practical implication of being clear as to the main purpose of the uplift is that it puts boundaries on the benefits that we consider when we use the loss analysis model to estimate the optimal percentile. We have further considered how de-carbonisation impacts on our analysis of this issue. We have concluded it is mainly relevant to the extent that is relates to the likelihood or impact of outages. As the economy becomes more dependent on electricity, we should expect the costs of outages to increase.

6.47 The issue has also been raised as to whether the WACC percentile uplift incentivises energy networks to choose a capex solution where an operating expenditure (**opex**) solution would have been optimal (capex bias problem).[276] Such a capex bias could harm innovative opex solutions to meet the de-carbonisation challenge.

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[274] Commerce Commission "Electricity Distribution Input Methodology Amendments Determination 2014" (27 November 2014) and Commerce Commission "Default price-quality paths for electricity distribution businesses from 1 April 2020 - Final decision" (27 November 2019), Chapter 7 and Attachment M.

[275] CEG "Memorandum: Updating the 2014 WACC Percentile" 'Appendix B -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, 26 January 2023), pp. 29-30, para 83-86 estimate savings from a smarter network of 4%-8% for distribution hardware and 10% for transmission expenditure.

[276] Commerce Commission: "Electricity distributors' expenditure incentives under the current Part 4 approach and under a totex approach Staff working paper to inform 7 November 2022 workshop 'Forecasting and incentivising efficient expenditure for EDBs'" (1 November 2022).

6.48 We do not consider that it is necessary to make any adjustment to the model or the results to account for capex bias. Because the WACC percentile uplift is applied to the whole RAB, the magnitude of any capex bias is likely to be too small to have a real impact on the cost of the uplift:

6.48.1 annual capex is a fraction of the RAB;

6.48.2 capex that should optimally have been opex is a fraction of capex; and

6.48.3 where capex is substituted for opex, consumers still benefit from the capex, and so the net cost to consumers of the capex bias is the difference between the cost of the capex and the cost of the opex for which it was substituted.

6.49 Accordingly, the magnitude of the cost is small relative to the total cost of the uplift.

6.50 We note here that there was a parallel discussion when we developed our current framework. Professor Vogelsang, writing for the Commission, expressed concern that the loss analysis model only considers nominal values for a single estimation year, and does not consider the impact of using a percentile above the 50th on future investment decisions.[277] As noted above, MEUG raise similar concerns when they note that the model ignores dynamic effects.

6.51 However, as Professor Vogelsang acknowledged in a follow-up report, the additional investments that may be made because of the uplift (that do not relate directly to network reliability) do provide benefits to consumers. Consequently, the net cost of these additional investments to consumer welfare is less than the total amount of benefit from any additional investment that is induced by having the WACC above the mid-point.[278]

The incentives on investment and our ability to monitor and address quality issues

6.52 In 2014 we recognised there are influences other than the WACC on incentives to invest. Under PQ regulation, suppliers face many factors other than WACC which can impact on their investment decisions:

6.52.1 an incentive to reduce capex (and opex) within the regulatory period (once regulatory allowances have been set);

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[277] Ingo Vogelsang "Review of Oxera's report, Input methodologies – Review of the '75th percentile' approach" (10 July 2014), p. 4, para (5)-(6).

[278] Ingo Vogelsang "Review of New Zealand Commerce Commission "Amendment to the WACC percentile for electricity lines services and gas pipeline services", Reasons paper published on October 30, 2014." (24 October 2014) p. 8, para 22d.

6.52.2 investors in regulated suppliers having a longer-term focus, and being less likely to concentrate on incremental, within control period, incentives for investment;

6.52.3 quality standards, and the consequent penalties for breaching these;

6.52.4 the need for a regulated business to credibly argue for an investment allowance at the beginning of the next regulatory period;

6.52.5 summary and analysis of relative supplier performance (including scrutiny of asset management plans), and of supplier performance over time, under ID regulation; and

6.52.6 other factors outside the Part 4 regulatory regime (including, for example, mandated safety standards and the potential for reputational harm to directors if "the lights go out").

6.53 The impact of the WACC, including any uplift, on incentives to invest needs to be considered in the context of an incentive regime that rewards under-spending of allowances and the mitigants against under-spending described above.

6.54 These alternative mitigants to this quality issue have been strengthened in three respects since 2014.

6.54.1 We have imposed penalties on businesses for breaching quality standards. In 2014 the possibility of taking action existed, but we had not done so.

6.54.2 We introduced a quality incentive scheme for EDBs in 2014. The scheme rewards regulated suppliers for exceeding quality benchmarks and penalises them for falling short of the quality benchmarks.

6.54.3 We have increased our scrutiny of asset management plans and we collect more information about assets and investments through ID than we did in 2014.[279] We agree with MEUG (cited above) that the likelihood of under-investment going undetected has decreased since 2014. Both of these point to less reliance being needed on a WACC percentile to mitigate the risk of under-investment leading to outages.

[279] For example, we now publish a dashboard that includes information on reliability data, asset ages, and asset reliability for EDBs.

The updated results of the loss analysis model

6.55 We have used the loss analysis model developed for us by Oxera in 2014 to estimate empirically the costs and benefits of a percentile above the mid-point. As part of our 2014 review of the percentile, we considered several models that offered alternative approaches to estimating the costs and benefits of a WACC percentile above the mid-point. The one we view as being most useful is one developed for us by Oxera and is based on the loss analysis approach. The loss analysis model estimates the optimal WACC percentile by comparing the cost of higher bills for consumers to the benefits of avoided outage costs based on a consumer welfare standard.[280]

6.56 The loss analysis model cannot provide a precise answer given the fundamental uncertainties which exist such as the linkage between under-investment and quality, however the results of the loss analysis can be useful in guiding judgement.[281]

6.57 In their submissions on the present review, Oxera cite a recent academic paper by Romeijnders and Mulder in which the authors develop a model that examines the costs and benefits of a higher WACC with the expected costs of under-investment leading to outages.[282] It expresses the idea of the loss analysis model that we use, but with added complexity relative to our loss analysis model.

6.58 In their review of Oxera's submissions, CEPA note that the Romeijnders and Mulder model depends on the specific behavioural assumption that regulated suppliers will only invest if the WACC is greater than their cost of capital. As CEPA note, this is one very specific behavioural assumption, and different, equally reasonable behavioural assumptions, could lead to different answers:[283]

> If the regulator determines an allowed return based on an estimate of WACC that is unbiased, then over the life of an energy network assets (decades), the investor can anticipate receiving an expected return that is close to its cost of capital. Therefore, even if the current allowed return is below the WACC, it is rational for an investor to continue to invest in the network.

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[280] We considered whether our analysis of the appropriate percentile should be based on a consumer- or total-welfare standard. Our decision was to use a consumer welfare standard: Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services Reasons paper" (30 October 2014), para 2.35 and Attachment A.

[281] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services Reasons paper" (30 October 2014), paras X14 to X16.

[282] Oxera "Asset beta and WACC percentile for New Zealand GDBs" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for First Gas, PowerCo and Vector, 1 February 2023), paras 4.25-4.29 and 4.39-4.40; Oxera "Review of the percentile of WACC distribution" -'Submission on IM Review CEPA reports (report prepared for 'Big 6 EDBs', 31 January 2023), section 5.1 and A2.

[283] CEPA "Review of Cost of Capital 2022/ 2023: response to submissions" (report to the Commerce Commission, 15 May 2023), para 2.2.2.

> If a regulatory framework incentivises network reliability with financial rewards and penalties, then failing to invest in network quality will lead to a change in returns that is not simply allowed return x change in RAB. This may make the marginal impact on changes in investments that affect network quality higher than the allowed return.

6.59 We agree with CEPA that in modelling the response of regulated suppliers to the regulated WACC, that different behavioural assumptions will lead to different outcomes. However, we do consider that if, at a reset, a WACC is set that is materially below the level needed to compensate investors, it is reasonable to suppose that businesses may rationally seek to delay investment and that this underinvestment can accumulate over time. As discussed in paragraph 6.52, we agree with CEPA that incentives other than the WACC impact decisions to invest.

6.60 We consider that there are more fundamental reasons for continuing using our loss analysis model in preference to the Romeijnders and Mulder model. The optimal percentile that we estimate with the loss analysis model is uncertain because the inputs (the annual cost of outages) and some of the relationships (the link between the WACC, under-investment, and outages occurring) are uncertain.[284] That is why we need to consider wider evidence and apply judgement in deciding on the appropriate WACC percentile. We do not consider that there is value in using a more complex model that expresses a similar idea, where the additional refinements and complexity do not address any of the underlying uncertainties.

6.61 We therefore continue to rely on our loss analysis model for guidance but emphasise again that it is an aid to judgement.

6.62 In estimating the optimal percentile using our loss analysis model, we need to make two choices that are uncertain: the amount by which the WACC needs to be below the true cost of capital before under-investment occurs; and the cost of outages when they occur.

6.63 In the past we have used the loss analysis model to estimate the optimal percentile at two thresholds:[285]

6.63.1 where under-investment takes place if the WACC is more than 0.5% below the true cost of capital; and

6.63.2 where under-investment takes place if the WACC is more than 1% below the true cost of capital.

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[284] We explain the uncertainties around the percentile uplift more fully in Commerce Commission " Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services - Reasons paper " (30 October 2014), paras X15-X16, 4.5, and 4.12.

[285] For a discussion on these thresholds see Commerce Commission, "Fibre input methodologies: Main final decisions - reasons paper" (13 October 2020), paras 6.822 - 6.828.

6.64 In 2014 we wrote that it is instinctively consistent with the workings of financial markets and the competition for capital that a shortfall of 0.5–1% (or more) is likely to increase the risk of triggering a rebalancing of medium-term investment plans, and a move by investors towards deferring investment as far as possible. While submissions consider alternatives to the 0.5% and 1% thresholds that we have emphasised in the past, we do not consider there is a good reason to move away from emphasising them.[286]

6.65 Estimating the costs of outages is more difficult, and submitters have taken different approaches to estimating them.

6.65.1 Oxera (2014, writing for the **Commission**) estimated the cost of outages as a percentage of Gross Domestic Product (**GDP**) using evidence from international studies. From a wide range of 0.4%-1.8% of GDP ($0.7-3.7 billion), they settled on a preferred range of $1-3 billion. Their analysis then relied on the lower bound of $1 billion. [287]

6.65.2 CEPA (2022, writing for the Commission) start with the $1 billion that Oxera used in 2014 and update it to the present using changes in the value of lost load to arrive at an estimated cost of $1.9 billion.[288]

6.65.3 Oxera (2023, for the 'Big 6' EDBs and for Vector, Powerco, First Gas) update the studies that they used in 2014, arriving at a wide range of 0.13%-1.8% of GDP ($0.9-6.4 billion). They argue that a 2011 study by the American Association of Civil Engineers (**ASCE**) is the most reliable basis for estimating blackout costs. By Oxera's calculations, the ASCE range for the cost of outages is between 0.29%-0.38% of GDP (1.102-1.444 billion). Taking account of CEPA's update, Oxera arrive at a slightly different preferred range of $1-1.9 billion.[289]

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[286] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services Reasons paper" (30 October 2014), para 5.22.3. For a fuller discussion, see Commerce Commission, "Fibre input methodologies: Main final decisions - reasons paper", (13 October 2020), paras 6.822 to 6.828. For an example of a submission that uses thresholds other than 0.5% and 1%, see CEG "Memorandum: Updating the 2014 WACC Percentile" 'Appendix B -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, 26 January 2023), p. 6, Figure A1.1.

[287] Oxera "Review of the '75th percentile' approach" (report to the Commerce Commission, 23 June 2014), p. 44.

[288] CEPA "Review of the cost of capital 2022/2023" (report to the Commerce Commission, 29 November 2022), pp. 24, 40.

[289] Oxera "Review of the percentile of WACC distribution" -'Submission on IM Review CEPA reports (report prepared for 'Big 6 EDBs', 31 January 2023), pp. 25-28, section 4.14, including Table 4.1; Oxera "Asset beta and WACC percentile for New Zealand GDBs" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for First Gas, PowerCo and Vector, 1 February 2023), pp. 41-45, section 4.2.3, para 4.42 - 4.56, including Table 4.4.

6.65.4 CEG estimate the cost of outages as a percentage of the value of the RAB. Their starting point is 6.8% of the combined Transpower and EDB RABs, which corresponds with Oxera's (2014) use of $1.0 billion as their preferred estimate of the cost of outages.[290]

6.66 To standardise the comparison, we have estimated the optimal percentile using our best estimate of the submitters' costs of outages with our updated estimate for the standard error of the WACC, and a combined EDB and Transpower RAB of $18.4 billion. Where the costs of outages are expressed as a percentage of GDP, we have estimated a New Zealand dollar cost of outages using a 2022 nominal GDP of $380 billion. We also account for the fact that consumers pay before-tax costs of the uplift, while businesses receive the after-tax benefits.[291]

6.67 We consider that the most relevant scenarios:

6.67.1 CEPA's estimate of outage costs of $1.9 billion;

6.67.2 Oxera's preferred range for outage costs of $1.0-1.9 billion;

6.67.3 ASCE's range for outage costs, our calculation based on Oxera's estimated percentage of GDP, of $1.1-1.45 billion; and

6.67.4 our calculation of outage costs based on CEG's estimate of outage costs of 6.8% of the RAB of $1.25 billion.

6.68 In 2014, Oxera focused on the low estimate of outage costs. We do the same here. In response to MEUG's concern that our estimate of the cost of outages is too high given that major outages typically have multifactorial causes, and we are assigning the benefits of avoiding those costs to electricity lines companies only, we note that while we estimate the full range of costs of outages, we use the lower bound estimate in the empirical analysis.

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[290] CEG "Memorandum: Updating the 2014 WACC Percentile" 'Appendix B -Submission on IM Review CEPA report on cost of capital' (report prepared for Electricity Authority Networks, 26 January 2023), p. 4, para 11 explains their approach writing that: "on the assumption that the RAB grows more or less in line with the value of the electricity supply chain this allows for a simple comparison across periods with different RABs."

[291] The treatment of taxes is discussed in our 2014 Reasons paper: Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services: Reasons paper" (30 October 2014), p. 119, para 6.58 and accompanying n.

6.69 In response to MEUG's request that we quantify the benefits of the uplift, we consider that the estimates of the costs of outages and the probability of those costs being incurred, based on the standard error of the WACC and the threshold at which we evaluate the optimal percentile, provide a reasonable estimate of the benefit of the uplift.

6.70 The results are as follows:[292]

6.70.1 CEPA's estimated costs of $1.9 billion yields an optimal percentile of:

6.70.1.1 68% at the 1% threshold; and

6.70.1.2 83% at the 0.5% threshold.

6.70.2 Oxera's preferred estimate of $1.0 billion yields an optimal percentile of:

6.70.2.1 48% at the 1% threshold; and

6.70.2.2 67% at the 0.5% threshold.

6.70.3 The ASCE estimate of $1.1 billion, based on our and Oxera's calculations, yields an optimal percentile of:

6.70.3.1 52% at the 1% threshold; and

6.70.3.2 70% at the 0.5% threshold.

6.70.4 The estimate of $1.25 billion based on CEG's use of 6.8% of the RAB yields an optimal percentile of:

6.70.4.1 56% at the 1% threshold; and

6.70.4.2 74% at the 0.5% threshold.

6.71 We did not specify the optimal percentiles in 2014, but instead highlighted Oxera's view that the optimal percentile lay between the 60th and 70th percentiles.[293]

[292] We are uncertain on why there are differences between the percentiles that the experts argue for in their reports and the optimal percentiles reported in this memo which we have calculated from their estimates of outage costs. We suspect it may be due to the treatment of taxation. Because the uplift is calculated to give businesses an after-tax return, while consumers pay pre-tax revenue, the uplift is less effective than it would be if there were no corporate taxes.

[293] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services: Reasons paper" (30 October 2014), p. 119, p. 102, para 6.6.

6.72 The range of percentiles based on the Oxera, ASCE, and CEG estimates of the cost of outages are similar to the range that Oxera found in 2014 given the inherent range of uncertainty. The only estimate that is materially different is CEPA's, and we note CEPA's concern that their estimate is more likely to be too high than too low. Specifically, while they have updated Oxera's 2014 estimate of $1 billion using the change in the Value of Lost Load, they are concerned that the $1 billion was too high as a starting point.[294] We note that the lower end of Oxera's range today is lower than the $1 billion that they used in 2014.

6.73 Overall, the loss analysis model results support the use of a percentile between the 55th and the 75th for PQ regulation, with the 65th percentile as the mid-point of the range.

Reasonableness checks and other evidence on the 65th percentile

6.74 In this section we consider wider evidence that the 67th percentile has provided adequate incentives for investment, and that our forward-looking estimates suggest that the 65th percentile will provide adequate incentives for investment.

6.75 We have undertaken reasonableness checks of our updated parameters by:

6.75.1 comparing the WACCs that our updated parameters produce relative to the WACCs used by investment analysts and other regulators. We consider that the investment analysts' forecasts are most relevant as comparators; and

6.75.2 considering the RAB multiple for the sale of Eastland Network and broker estimates of the RAB multiples for the regulated parts of Vector's business.

6.76 The reasonableness checks are presented in Chapter 7.

6.77 We have estimated illustrative WACCs using our updated parameters and the 65th percentile. In Figure 7.1 we present a comparison of our illustrative WACCs to broker estimates of Vector's cost of capital and regulatory WACCs from comparable international regulators. Our illustrative 65th percentile WACC is at the upper end of broker estimates of Vector's cost of capital. Because of this, we consider that the 65th percentile will provide adequate incentives for investment.

[294] CEPA "Review of Cost of Capital 2022/ 2023: response to submissions" (report to the Commerce Commission, 15 May 2023), p. 27, para 6.1.2.

6.78 RAB multiples are the ratio of the market value of a regulated asset to its regulatory book value. RAB multiples are impacted by more than just the WACC. Among other influences, they incorporate future expectations of regulatory settings and the expected ability of the business to earn higher returns through the incentive scheme, and there will always be a concern that the purchaser has overpaid.

6.79 In November 2022 it was announced that the Eastland Network was being sold. The sale was completed on the 31st of March 2023. The announced sale price is at a reported RAB multiple of 1.38.[295] However, the RAB multiple for the Eastland sale is evidence that equity holders are not being under-compensated with the WACC at the 67th percentile. Similarly, broker estimates of the RAB multiple for Vector that are presented in Table 7.6 are greater than one. These estimates support the view that shareholders have been adequately compensated with the WACC at the 67th percentile.

6.80 We note that Aurora Energy applied for a CPP in 2020 to address historical under-investment in its network. We do not consider Aurora Energy's under-investment to have been influenced by the cost of capital however, but due to other factors such as its underlying asset management capability and governance.[296]

6.81 Finally, we conducted a full confidential debt survey as part of this review. The results show that regulated businesses have continued to raise debt. Given that they would only do so if it was in the best interests of their shareholders, we consider that shareholders have been adequately compensated when we have set the WACC at the 67th percentile.

6.82 The evidence from our reasonableness checks suggests that there has been no issue where the WACC has been set at the 67th percentile, and that on a forward-looking basis, the 65th percentile will produce commercially realistic WACCs.

International regulatory practice

6.83 When we decided to use the 67th percentile of the WACC in 2014, among the evidence that we considered was that comparable international regulators often exercised judgement by choosing a WACC above the mid-point, either directly or by using individual parameters that were generous in favour of suppliers.[297]

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[295] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services: Reasons paper" (30 October 2014), Attachment C, pp. 149-173.

[296] Some of the issues around Aurora Energy's governance structure are discussed here.

[297] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services - Reasons paper" (30 October 2014), paras X20.3 and 5.84.3; Oxera "Review of the '75th percentile' approach" (report to the Commerce Commission, 23 June 2014), section 3.5.

6.84 In their report for us, CEPA provided an update on international regulatory practice.[298] Their update points to an increased tendency among regulators to choose the mid-point WACC than was the case in 2014. For example, in 2014 Oxera reported that between 2009 and 2012, Ofgem's decisions for energy transmission and distribution were made between the 58th and 83rd percentiles. CEPA's update points to Ofgem's most recent decisions being made at the 50th and 51st percentiles.[299]

6.85 Oxera questioned the strength of CEPA's evidence of regulators aiming to the mid-point, citing the example of three regulators that have made recent decisions to use a WACC above the mid-point.[300] In response to these submissions, CEPA have reaffirmed their finding of more regulators aiming for the mid-point. They note that in one instance of aiming up that Oxera point to, the CMA used our uplift as part of their reasons for using a WACC above the mid-point.[301]

6.86 MGUG point to CEPA's evidence in arguing that we should use the mid-point, highlighting the AER's statement that any movement away from the midpoint is arbitrary.[302] We agree with CEPA and MGUG that comparable international regulatory practice has shifted from aiming up to the mid-point and we have considered this evidence in arriving at our draft decision. However, we disagree with the contention that any departure must necessarily be arbitrary. Where we have decided to use a percentile above the mid-point, that decision has been based on considerations that include a quantification of the costs and benefits to consumers of the uplift.

Summary of our decision to use the 65th percentile for EDBs and Transpower

6.87 Our draft decision is to use the 65th percentile for PQ regulation of EDBs and Transpower. We have considered a wide range of evidence in arriving at this decision.

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298 CEPA "Report on Cost of Capital 2022/ 2023" (report to the Commerce Commission 'IM Review 2023' (29 November 2022), section 4.3.

299 CEPA "Report on Cost of Capital 2022/ 2023" (report to the Commerce Commission 'IM Review 2023' (29 November 2022), table 4.2.

300 Oxera "Review of the percentile of WACC distribution" -'Submission on IM Review CEPA reports (report prepared for 'Big 6 EDBs', 31 January 2023), section 4.5 and Appendix A1; and Oxera "Asset beta and WACC percentile for New Zealand GDBs" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for First Gas, PowerCo and Vector, 1 February 2023), pp. 3-4 and paras 4.17-4.24.

301 CEPA "Review of Cost of Capital 2022/ 2023: response to submissions" (report to the Commerce Commission, 15 May 2023), paras 2.11.4.

302 Major Gas Users Group "Submission on IM Review CEPA report on cost of capital" (3 February 2023), paras 24-26.

6.88 We have used the same broad framework for determining the appropriate percentile that we developed in 2014.

6.89 We have updated our estimate of the appropriate percentile using the loss analysis model. The results point to a range of the 55th to the 75th percentile. The 65th percentile is the mid-point of this range.

6.90 We have considered the available evidence on RAB multiples. This evidence suggests that there was no investment issue with the 67th percentile of WACC being used for price-quality regulation. However, the RAB multiple evidence can only tell us that the WACC was unlikely to be too low. On a forward-looking basis, our updated parameters produce commercially realistic WACCs at the 65th percentile when compared to estimates of the cost of capital for regulated suppliers from brokers and investment analysts.

6.91 We have considered the evidence that comparable international regulators are increasingly aiming to the mid-point in setting WACCs. This is a change from 2014, when comparable international regulators were setting WACCs above the mid-point, either directly or through the choice of parameters that were generous to regulated suppliers.

6.92 In addition to the results of the loss analysis model, reasonableness checks, and consideration of the decisions of comparable international regulators, we have also considered changes in our own regulatory regime. In 2014 we noted that incentives to invest are motivated by more than just the expected return on investments. The further incentives that we considered in 2014 are set out in paragraph 6.52.

6.93 A key concern a percentile above the mid-point is meant to address is that deterioration in the quality of the network goes undetected over time and results in material events such as outages. Since 2014, our regime has improved in three respects that have a bearing on incentives to invest and the likelihood that businesses will underinvest or that the underinvestment will go undetected.

6.93.1 Our monitoring of asset quality has improved. As noted, we now publish live dash boards that include asset ages. We also undertake scrutiny of asset management plans. The increased scrutiny decreases the likelihood that under-investment would go undetected.

6.93.2 In 2014 we introduced a quality incentive scheme for EDBs. The scheme rewards regulated suppliers for exceeding quality standards and penalises them for falling short of quality standards. The quality incentive scheme provides EDBs with financial incentives to maintain their network.

6.93.3 Since 2014 we have undertaken enforcement action against EDBs that have breached quality standards. While enforcement action existed as a possibility before 2014, that fact that we have undertaken action makes the expectation that we will do so in the future more credible. Enforcement action, and the associated direct and indirect (reputational) costs, increase the incentive for regulated suppliers to maintain their network.

6.94 We consider that our draft decision to use the 65th percentile is a conservative one. The improvements in our monitoring and enforcement and the quality incentive scheme all point to less reliance being needed on the WACC uplift to reduce the probability that EDBs (in particular) and Transpower do not maintain their networks. These considerations are supported by the considered decisions by other regulators increasingly to set WACCs at the mid-point.

6.95 Our draft decision to use the 65th percentile is based partly on our desire to provide regulatory certainty, including using the same model that we have used in the past to estimate the appropriate range for the uplift. We have also taken into account the significant degree of uncertainty in our empirical estimate of the appropriate percentile. The optimal range that we have estimated is wider than in 2014.

6.96 We do not consider that the improvements in our monitoring and enforcement are a substitute for setting the WACC at an appropriate level. However, we reiterate that the mid-point WACC is our best, unbiased estimate of the true cost of capital, and that any uplift results in a WACC that is above our best estimate of the true cost of capital.

Should we apply the uplift to gas?

6.97 In 2014 we developed the empirical case for the 67th percentile solely with reference to electricity distribution and transmission. We then applied that decision equally to electricity distribution, Transpower, and gas distribution and transmission because we believed the issues relevant to the decisions for these services to be similar enough for the same percentile to apply.[303] In the Process and issues paper we asked for views on whether it is appropriate for any uplift that we determine with reference to electricity to also be applied to gas.

6.98 As noted above:

6.98.1 MGUG favour removing the uplift for gas;

[303] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services Reasons paper" (30 October 2014), para 1.26.

6.98.2 Oxera, writing for Vector, First Gas, and Powerco, support retaining at least the 67th percentile.

6.99 First Gas support the uplift for gas, writing that:

> "The intuition [for gas] is the same as for electricity. The Oxera report carefully traces the intuition and empirics for choosing the 67th percentile of the WACC range for regulated energy networks – that when consumers are deprived of a reliable energy supply the costs incurred are greater than the costs incurred for the same level of over-investment. In our view this asymmetry applies as much to consumers of gas pipeline services as to consumers of electricity lines services."
>
> […]
>
> "(c)onsumers (particularly major gas users) have emphasised the importance of reliable gas supply as they move to decarbonise their operations. In consultation on our 2022 asset Management Plan, we asked stakeholders what outcome is most important to them: price, risk, safety or reliability. Half of respondents listed reliability as the number one priority – twice the number of respondents that believed price should be our highest priority." [304]

6.100 As discussed above, the loss model that we used in deciding to use the 67th percentile was developed solely with reference to electricity outages. In 2014 we decided to apply the uplift to GPBs on the basis that gas pipelines are sufficiently similar to electricity networks that the same arguments apply.

6.101 The reason the loss model is based on electricity outages is that there is established literature on the cost of electricity outages. Oxera drew on this literature in 2014. We are not aware of any studies on the economic costs of outages to consumers of gas.

6.102 Oxera (writing for Vector, First Gas, and Powerco) make three specific points in favour of retaining the uplift for gas:[305]

6.102.1 as compensation for residual stranding risk;

6.102.2 to enable investment in renewable gas infrastructure; and

6.102.3 to ensure an orderly energy transition.

6.103 Having considered the available evidence, we do not consider that the points made by Oxera provide a sufficient basis for an uplift.

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[304] First Gas Group "Submission on IM Review CEPA report on cost of capital" (3 February 2023), pp. 3- 4.

[305] Oxera "Asset beta and WACC percentile for New Zealand GDBs" – 'Submission on IM Review CEPA report on cost of capital' (report prepared for First Gas, PowerCo and Vector, 1 February 2023), p. 47, para 4.65.

6.103.1 As discussed above, the main purpose of the uplift is to avoid outages from under-investment. The only point that Oxera raise that relates to under-investment or network reliability is related to energy transition and asset stranding.

6.103.2 Asset stranding risks are being addressed through adjustments to asset lives. We do not consider that these risks are systematic, and so they are not compensated or mitigated through the WACC.[306]

6.103.3 Under the Act, we only regulate gas pipelines services, i.e., the conveyance of natural gas by pipeline. Incentivising a transition to alternative uses would likely fall outside the purpose of the Act in relation to gas pipelines.

6.104 Our framework for deciding whether a percentile above the 50th is warranted depends on:

6.104.1 the probability that the WACC is too low;

6.104.2 the cost of the uplift to consumers in the form of higher bills;

6.104.3 the cost of outages where they occur; and

6.104.4 the probability that outages could result from under-investment in network reliability going undetected and so leading to outages.

6.105 Having reconsidered the available evidence, we believe that there are two respects in which gas is likely to differ from electricity:

6.105.1 the cost of electricity outages relative to the cost of gas outages; and

6.105.2 the likelihood that under-investment will go undetected and that this undetected under-investment will lead to outages is likely lower for gas.

[306] Citing the 2010 IMs, we explained in the 2014 Reasons paper that we considered a more appropriate response to asset stranding would be to change the depreciation profile for the at-risk assets: Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services: Reasons paper" (30 October 2014), p. 64, n 157. For an explanation of how we are handling stranding risks, see Commerce Commission "Part 4 Input methodologies Review 2023 - Draft decision - Financing and incentivising efficient expenditure during the energy transition topic paper" (14 June 2023), Topic D.

6.106 While we have no empirical basis for estimating a magnitude, we expect that the cost of outages will be lower for gas users than for electricity users. For many users, gas is a secondary energy source, and so the cost of outages is likely to be lower than for electricity. Gas outages do not result in electricity outages, but electricity outages result in gas outages as many applications for gas—continuous flow water heating and cooking equipment in domestic application—rely on electricity to run. In addition, electricity outages can have an impact on telecommunications, which gas outages do not.

6.107 The evidence on reliability is that gas networks are more reliable than electricity networks. The reason that there are more studies on the costs of electricity outages than gas outages is that there are more of them.

6.108 As part of our reporting on the performance of the electricity and gas networks, we report on the:[307]

6.108.1 System Average Interruption Frequency Index (**SAIFI**): The average number of times a consumer experiences an outage (total outages divided by total consumers); and

6.108.2 System Average Interruption Duration Index (**SAIDI**): the minutes of outages each consumer would experience if the total time for all outages were divided between all consumers.

6.109 The differences between electricity and gas are large for both measures.

6.110 The SAIFI for:

6.110.1 Electricity distributers is 1.47;

6.110.2 Gas distributers is 0.01.

6.111 The SAIDI for:

6.111.1 Electricity distributers is 210.2 (101.3 planned, 108.9 unplanned);

6.111.2 Gas distributers is 1.51.

6.112 These differences in reliability point to engineering differences that were not accounted for in our previous decision to apply the uplift to gas businesses.

[307] Our most recent report for electricity distributers can be downloaded here.

6.113 Our draft decision is to use the 50th percentile for gas. This is based primarily on these two points: the expected differences in costs of outages and the differences in reliability. Any set of estimates of the optimal percentile made using a lower expected cost of outages (in proportion to GDP) and the much lower probability of undetected under-investment leading to outages includes the mid-point within the range or sits entirely below the mid-point. We do not consider that it is appropriate to use a WACC that is less than our best, unbiased estimate of the true cost of capital, and so our draft decision is to use the 50th percentile.

6.114 The draft decision is supported by MEUG's observation, which we agree with, that the risk of under-investment in gas is moderated by the ability of gas users to switch to alternative fuels (LPG and electricity). This observation is consistent with our view that gas is a secondary fuel.

6.115 In reaching our draft decision for gas, we have also considered the wider changes in our regime that we noted above, including improvements in our scrutiny of AMPs and improvements in ID. We also took account of the change in regulatory precedent discussed above. We note with respect to the reasonableness checks that our only estimate of a RAB multiple for gas is for Vector, and the RAB multiple of one reflects regulatory uncertainty around climate change.

Our decision regarding the appropriate WACC percentile for ID regulation

6.116 We also need to consider the consequential impact of our draft decision on the WACC determinations for ID regulation.[308] Here:

6.116.1 Given our draft decision to use the 65th percentile of WACC for the purpose of PQ regulation of EDBs and Transpower, we will publish the 25th, 50th, 65th and 75th percentiles of WACC for ID regulation for EDBs and Transpower.

6.116.2 For GPBs, our draft decision to use the mid-point of the WACC for the purposes of PQ regulation will also be reflected in continuing to publish the 25th, 50th, and 75th percentiles, but no longer publishing the 67th percentile of WACC in ID regulation WACC Determinations.

6.117 We note that in practice interested parties can calculate whatever percentile of WACC they may be interested in from the information available.

[308] In 2014 we issued a separate reasons paper: Commerce Commission, "Amendments to the WACC percentile range for information disclosure regulation for electricity lines services and gas pipeline services: Reasons Paper, (12 December 2014).

6.118 In 2016 we amended the approach to airport ID regulation by no longer publishing the 25th and 75th percentile.[309] Instead we decided to publish our mid-point estimate of the WACC together with the standard error of that estimate. The standard error can be used to determine the probability distribution of the WACC estimate and any individual WACC percentile required.

6.119 Under our approach to reviewing airport PSEs we allow for airports to justify departures from our best estimate of WACC for the airport sector and we can consider the evidence supporting those departures.

6.120 We believe this approach has worked well in the PSEs that have occurred since the amendments and we have no reason to move from that approach now, hence our draft decision is that no amendments are required.

Four-year regulatory period

6.121 We propose to allow for the estimation of a WACC for a four-year regulatory period for EDBs DPPs, and Transpower's IPPs. The proposed change will affect:

6.121.1 the risk-free rate; and

6.121.2 debt issuance costs.

6.122 We amended the GPB IMs to allow for the estimation of a WACC for a four-year regulatory period as part of DPP3.[310] In the Process and issues paper we raised the possibility of making similar changes for EDBs, Transpower, and airports. [311]

6.123 While the Act allows for a regulatory period shorter than five-years (but not less than four-years), the current cost of capital IMs for EDBs, Transpower, and airports only provide for WACC estimates that reflect a five-year regulatory period. In our original IM decisions, we discussed that the WACC should align with the term of the regulatory period. However, the IMs as drafted only provided for a WACC estimate that reflected the usual five-year regulatory period.

[309] Commerce Commission, "Input methodologies review decisions Topic Paper 6: WACC percentile for airports" (20th December 2016), Table X1.

[310] Commerce Commission “Amendments to input methodologies for gas pipeline businesses related to the 2022 default price-quality paths – weighted average cost of capital: Reasons paper” (March 2022).

[311] Commerce Commission “Part 4 Input Methodologies Review 2023: Process and issues paper” (May 2022), p. 106.

6.124 We consider that we should make the same change to the cost of capital IMs for EDBs and Transpower to ensure we can determine an appropriate WACC in the event we apply a four-year regulatory period to a DPP for EDBs or an IPP for Transpower. Accordingly, we propose to amend the methodology for estimating the risk-free rate, and the estimate for debt issuance costs, as follows:

6.124.1 aligning the risk-free rate with the regulatory period (i.e., calculated against a four-year or a five-year bond); and

6.124.2 debt issuance costs are for 0.20% for a five-year regulatory period, and 0.25% for a four-year regulatory period.

6.125 As airports are only subject to ID regulation, they do not have a regulatory period like EDBs, Transpower, and GPBs that we can adjust. We do not propose to make amendments for airports as we can account for the term of the risk-free rate when undertaking analysis of PSEs, and the approach to other sectors will offer clear guidance to airports about our approach.

Submitters' views on four-year regulatory period (energy)

6.126 We received no objections to the proposed changes to calculating a cost of capital where a four-year regulatory period applies for EDBs and Transpower.

6.127 For example, Transpower considered that it makes sense to adjust the WACC calculation for a shorter regulatory period:[312]

> Finally, we note that the Commission adjusted the WACC calculation for the gas DPP reset to reflect the shorted regulatory period adopted (4 years rather than 5). The Commission did the same for the initial Fibre price-quality path which was set at 3 years. It may make sense to amend the WACC IM to automatically provide that the WACC calculation mirrors the duration of the regulatory period.

6.128 Aurora Energy submitted that:[313]

> We note the Commission's proposal to adjust the IMs to allow for a four-year regulatory period, as occurred for GPBs earlier this year. Aurora considers that very different futures face GPBs and EDBs, and that there is probably not the same imperative to make this change for EDBs. Having said that, the required modifications seem, on the face of it, to be relatively mechanical and uncontroversial.

[312] Transpower NZ Ltd "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), p. 29.

[313] Aurora Energy "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), p. 14.

6.129 First Gas submitted that they support the amendments made in the cost of capital IMs to allow for a four-year regulatory period when determining the risk-free rate as part of gas DPP determination, they also submit that:[314]

> Given the interaction between parameters used to estimate the cost of capital, it is important to ensure that all parameters are estimated consistently. The Commission recognised this when amending the cost of capital IMs by adjusting the TAMRP to reflect the shorter regulatory period adopted then.

6.130 As discussed in paragraph 4.180, we consider that the TAMRP estimate does not vary between four- and five-year regulatory period when rounded to the nearest 0.5%. Therefore, we consider a single rate for TAMRP of 7.0% is appropriate for all WACC determinations for Part 4.

Submitters' views on four-year regulatory period (airports)

6.131 Airports and airlines prefer current five-year regulatory periods and do not support a change.

6.132 For example, BARNZ considered that there is:[315]

> some merit in reducing to four years the IM review process to better reflect the fast-changing macro-economic environment. However we agree with the points raised by TDB that consistency and lower transaction costs are benefits of keeping it at the current 5 years

6.133 NZAA submitted that: [316]

> We are not convinced that the Commission needs to explore this topic for airports. On the one hand, it makes sense for the WACC IM to be consistent across all regulated sectors in this respect, and airports do have flexibility to choose a pricing period of less than five years. It may therefore appear desirable for the WACC IM to include flexibility so that the Commission's assessment of target returns using the WACC IM is matched to the pricing period. On the other hand, it is rare for airports to adopt a pricing period that is less than five years. If any airport chose to do so, the impact of that shorter period could be factored into the pricing WACC and subsequent review by the Commission, without amending the WACC IM as part of this review.

6.134 We agree with NZAA that airports are able to adopt a short pricing period if they choose to and the impact can be reviewed at PSEs.

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[314] First Gas Limited "Submission on IM Review Process and Issues paper and draft Framework paper" (13 July 2022), p.26.

[315] Board of Airline Representatives New Zealand Inc. "Submission on IM Review Process and Issues and draft Framework paper" (11 July 2022), para 10.

[316] NZ Airports Association Inc. "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), pp.10-11.

Split cost of capital

6.135 A split cost of capital would involve applying different WACC values to existing 'sunk' assets and capital on new assets (for example, during construction and commissioning). In theory, this can reflect that expenditures on new major projects can carry greater risk than allowed for in the rate of return applying to the return on existing assets already in the RAB.

Submitters' views on split cost of capital

6.136 MGUG submitted that they would like us to consider a split cost of capital because: "(I)t is possible that some new investments may require incentives. For example, we can see arguments in favour of investments for repurposing gas pipelines. An incentive could be a split cost of capital."[317]

6.137 Transpower, Aurora Energy and Wellington Electricity submitted that we should not give further consideration to the use of a split cost of capital.[318]

Our view

6.138 We propose to maintain our current decision of not introducing a split cost of capital. Given that no new evidence has been provided and that the impacts of a change to a split cost of capital are ambiguous, we do not consider that this change would outweigh the potential costs.

6.139 We assessed the possibility of a split cost of capital in our 2016 IM Review and decided not to apply a split cost of capital approach due to the implementation difficulties and increased regulatory risk.[319]

6.140 Our approach to setting the cost of capital applies at an industry level, and setting parameters that reflect what would effectively be project level risk would be very difficult to estimate and implement in practice.

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[317] Major Gas Users Group "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), para 18.

[318] Transpower NZ Ltd "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), pp. 23-25; Transpower New Zealand Ltd "Cross-submission on IM Review process and issues paper, and draft framework paper" (3 August 2022), p. 2; Aurora Energy "Submission on IM Review Process and Issues paper and draft Framework paper" (11 July 2022), para 59; Wellington Electricity "Cross-submission on IM Review process and issues paper, and draft framework paper" (10 August 2022), p. 4.

[319] Commerce Commission "Input methodologies review decisions – Topic paper 4: Cost of capital issues" (20 December 2016), pp. 172-175.

6.141 We consider that our approach to maintaining ex-ante FCM and our methodology for setting the WACC overall provides suppliers with incentives to invest without providing for a different WACC. Non-systematic risks can be more appropriately dealt with through measures outside of the WACC.

Chapter 7 Reasonableness checks

Purpose of this chapter

7.1 The purpose of the reasonableness checks is to test whether application of the IMs will produce commercially realistic estimates of the cost of capital. The reasonableness checks are intended to help identify any potential oddities in our estimates, which would suggest modifications should be made to the cost of capital IMs. The reasonableness checks we have undertaken are very similar to those used in the 2016 IM Review reasons paper,[320] and the 2020 Fibre IMs reasons paper.[321]

7.2 Unless otherwise indicated, all relevant calculations and reasonableness checks discussed in this chapter use the current cost of capital IMs, updated to reflect the draft decisions discussed in this topic paper (which we refer to in this section as the 'draft amended cost of capital IM').

7.3 Based on the analysis we have undertaken we consider that our WACC estimates using the draft amended cost of capital IMs are reasonable. In particular:

7.3.1 our 65th percentile post-tax WACC estimate of 6.43% for EDBs and Transpower, and mid-point post-tax WACC estimate of 6.39% for GPBs (as at 1st March 2023) are within the range of independent post-tax WACC estimates for regulated energy businesses in New Zealand. They are also above the WACC estimates from Australia, and below the WACC estimates from the UK (after normalising for differences in risk-free rates); and

7.3.2 our mid-point post-tax WACC for airports of 7.19% is within the range of alternative New Zealand-sourced post-tax WACC estimates for airports, and below the overseas WACC estimates from the UK and Ireland (after normalising for differences in risk-free rates).

7.4 The rest of this section:

7.4.1 explains our approach to undertaking reasonableness checks of our WACC estimates, and the adjustments we have made to help make alternative WACC estimates more comparable to our estimates;

7.4.2 summarises why we consider our WACC estimates for EDBs and Transpower, GPBs, and airports (as at 1st March 2023) are reasonable based on the information assessed;

[320] Commerce Commission "Input methodologies review decisions - Topic paper 4: Cost of capital issues" (December 2016).

[321] Commerce Commission "Fibre input methodologies: Main final decisions - reasons paper" (October 2020).

7.4.3 describes in detail the comparative information used when undertaking reasonableness checks for EDBs and Transpower, GPBs, and airports, respectively; and

7.4.4 outlines the RAB multiples analysis we have undertaken, as an additional reasonableness check.

Approach to undertaking reasonableness checks of our WACC estimates

7.5 This section explains the approach we have used when undertaking reasonableness checks of our WACC estimates, including:

7.5.1 the available comparative information we have considered;

7.5.2 the weight placed on WACC estimates from different sources; and

7.5.3 our approach to adjusting WACC estimates from other sources, to ensure they are comparable with our estimates.

We have used available WACC estimates

7.6 When undertaking our reasonableness checks, we have used available information on:

7.6.1 the current New Zealand returns on government bonds (proxy for the risk-free rate) and corporate bonds;

7.6.2 historic average and expected returns achieved on the New Zealand stock and bond markets;

7.6.3 independent estimates of the post-tax WACC for suppliers of regulated services in New Zealand, including estimates from PricewaterhouseCoopers (**PwC**) and New Zealand investment banks; and

7.6.4 the WACC estimates from regulators in Australia, Ireland, and UK.

7.7 Our WACC estimates for EDBs and Transpower, GPBs, and airports, as at the 1st of March 2023, are compared to the available information listed above. If the IMs produce reasonable WACC estimates as at the 1st March 2023, we consider they will also produce reasonable estimates at other dates since the risk-free rate will be linked to prevailing market rates.

We have placed most weight on New Zealand-sourced WACC estimates for regulated services

7.8 We have followed the 2016 hierarchy of available sources of information when assessing the reasonableness of our WACC estimates. In the following order of importance:

7.8.1 *the plausible range*: we compared our WACC estimates with a plausible range of returns on the New Zealand stock and bond market. The upper bound of the plausible range is the long-term historical average returns and expected future returns on the New Zealand market overall (assuming a hypothetical firm of average risk). The lower bound is the returns on five-year government bond (that is the returns on investment with no default risk) and the returns on BBB+/A- rated corporate bonds (ie, investments with some default risk but still comfortably considered investment grade);[322]

7.8.2 *New Zealand-sourced estimates of the cost of capital for regulated suppliers*: we compared our WACC estimates with available information on the cost of capital for New Zealand regulated suppliers sourced from brokers and practitioners; and

7.8.3 *Overseas estimates of the regulatory allowed returns on capital*:[323]we compared our WACC estimates with regulatory allowed returns on capital estimates from overseas regulatory decisions (primarily from Australia, Ireland, and UK) for electricity lines services, gas pipelines services, and airports.

7.9 We consider that New Zealand sourced WACC estimates should be given more weight than overseas estimates. International WACC estimates can be affected, among other things, by country-specific factors such as differences in tax regimes, monetary conditions, regulatory objectives and regimes. In its judgement on the IMs merits appeals, the High Court agreed that "…the most helpful comparative material for cross-checking purposes comprises independent assessments of WACC in the New Zealand context".[324]

[322] The upper limit of the range is based on the fact that regulated businesses are typically low risk, so equity investors would expect to earn a lower return for these businesses than when investing in a New Zealand company of average risk. For the lower limit of the range, the returns on BBB+ rated corporate bonds are used for EDBs/Transpower/GPBs, and the returns on A- rated corporate bonds are used for airports, reflecting the benchmark long-term credit ratings we have used when estimating the cost of debt.

[323] Regulatory allowed returns on capital include adjustments (such as an uplift, or adjustment for expected out-performance) made by regulators to the WACC estimated using the standard WACC formulas in finance literature.

[324] *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1213].

We have made adjustments to WACC estimates from other sources to ensure they are comparable

7.10 Different regulators and analysts may use different methods when determining their WACC estimates. They may also report their WACC in different forms, such as pre-tax, vanilla, or post-tax WACC, and in real or nominal terms. We therefore made adjustments to ensure they are comparable with our nominal, post-tax WACC.

7.11 We convert the other WACC estimates into a comparable nominal, post-tax WACC by:

7.11.1 converting Sharpe-Lintner CAPM (SL-CAPM)[325] estimates of the cost of equity to a SBL-CAPM[326] estimate; and

7.11.2 by normalising the adjusted WACC based on the prevailing risk-free rate and corporate tax rate used in our current WACC estimates.

Normalising the risk-free rate

7.12 We normalise the risk-free rate in our approach because the other WACC estimates used the risk-free rates available at the time of their estimation, and we do not consider the difference in risk-free rates as an input into the WACC estimates should be a factor that affects our reasonableness checks.

7.13 In addition, compared to regulators that use a trailing average cost of debt (under which the risk-free rate is also a trailing average of historical rates), during periods where domestic interest rates are relatively low in New Zealand, our WACC estimates are likely to appear low. Conversely, during periods where New Zealand interest rates are high, our WACC estimates will appear relatively high. Over time, these approaches should tend to balance out, but in the short term the comparability of the WACC estimates is affected.

7.14 To normalise for the difference between risk-free rates used in the WACC estimates, we have adjusted comparative WACC estimates to reflect the prevailing risk-free rate as at the 1st of March 2023 (which was 4.31%).

[325] This is the CAPM most widely used by regulators and practitioners in countries other than New Zealand.

[326] When converting the MRP in other regulators' WACC estimates to TAMRP, in principle we should use the investors' tax rate specific to that country. Lacking that information, we use a country's corporate tax rate, assuming that it is the same as the investors' tax rate.

We have considered RAB multiples, as an additional reasonableness check

7.15 As part of our reasonableness check, we have considered RAB multiples for regulated energy and airports businesses in New Zealand. The RAB multiple of a regulated business is the ratio of its enterprise value to its RAB. RAB multiples can provide a useful secondary indicator of whether the allowed rate of return has been set at a sufficient level to adequately compensate investors for putting their capital at risk.[327]

Summary of why we consider our WACC estimates are reasonable

Energy businesses

7.16 We consider that our WACC estimates are reasonable based on the comparative information we have assessed. Our findings for EDBs/Transpower/GPBs and airports are summarised in Figure 7.1 and Figure 7.2, respectively.

7.17 Our analysis for EDBs and Transpower focusses on the 65th percentile WACC estimate and our analysis for GPBs focusses on the mid-point WACC estimate, respectively, given that these are the estimates that will be used for PQ path regulation of these businesses under the proposed IM. We consider that our 65th percentile post-tax WACC estimate of 6.43% for EDBs and Transpower and mid-point post-tax WACC estimate of 6.39% for GPBs (as at 1st March 2023) are reasonable given they are:

7.17.1 below the long-term historical average returns of the New Zealand market overall (8.72%) and the New Zealand expected market returns (8.37%), but above the post-tax returns on five-year government bonds (3.10%) and five-year BBB+ bonds (4.19%). This is consistent with our expectations that businesses such as EDBs, Transpower, and GPBs are less risky than the average New Zealand businesses, but riskier than corporate bonds and government bonds;

7.17.2 within the range of independent post-tax WACC estimates in New Zealand, after normalising for differences in risk-free rates. For example, our estimates are above the average brokers' estimates for Vector (6.27%), but below PwC's estimates for Vector (7.50%) and for Utilities (8.60%); and

[327] See paragraphs 7.44 to7.56 for further discussion on RAB multiples.

7.17.3 within the range of recent overseas WACC decisions for energy businesses, after adjusting to the nominal, post-tax WACC forms and normalising for differences in risk-free rates. For example, our estimates are above a recent decision made by the AER in Australia (5.56%) and above a recent decision made by Ofgem in UK (5.96% for electricity distribution), but below a recent decision made by Ofgem in UK (7.46% for gas distribution, gas transmission and electricity transmission).

Airports

7.18 We have assessed the reasonableness of our airports WACC estimates based on our mid-point estimate. This is because we publish a mid-point WACC estimate for airports (along with the standard error of the WACC). We consider that the mid-point post-tax WACC estimate for airports of 7.19% (as at 1st March 2023) is reasonable given it is:

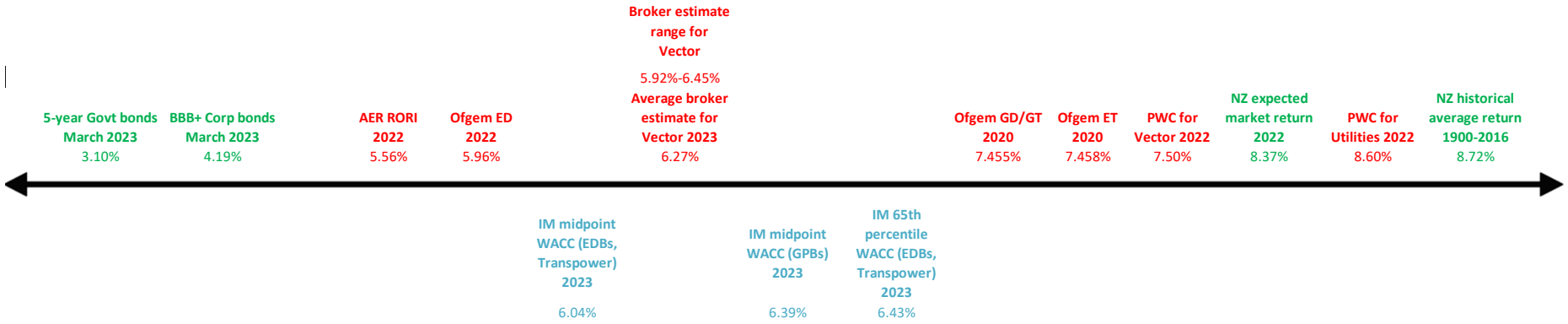
7.18.1 below the long-term historical average return of New Zealand market overall (8.72%) and the New Zealand expected market returns (8.37%), but above the post-tax returns on five-year government bonds (3.10%) and five-year A- corporate bonds (3.95%). This is consistent with our expectations that regulated airports services face lower risks than the average New Zealand firms, but greater risks relative to corporate bonds and government bonds;

7.18.2 within the range of New Zealand sourced post-tax WACC estimates for airports. For example, after normalising for differences in risk-free rates, our estimates are within the range of broker estimates for Auckland International Airport Limited (**AIAL**)'s WACC (ranged from 6.26% to 8.8%), but below PwC's estimate for AIAL's WACC (9.4%); and

7.18.3 below the recent overseas WACC decisions for airports (after adjusting to nominal, post-tax WACC forms and normalising for differences in risk-free rates), made by the UK CAA (8.47% for Heathrow) and the Commission for Aviation Regulation (**CAR**) in Ireland (8.37% for Dublin Airport).[328]

[328] We note that both regulators use a Total Market Return (TMR) approach to the TAMRP, meaning that their TAMRP-equivalent depended on the risk-free rate at the time that the determination was made. Accordingly, it is not appropriate to combine it with a different risk-free rate for the purposes of estimating a WACC.

Figure 7.1 Summary of WACC reasonableness checks for EDBs, Transpower, and GPBs (using normalised risk-free rates)

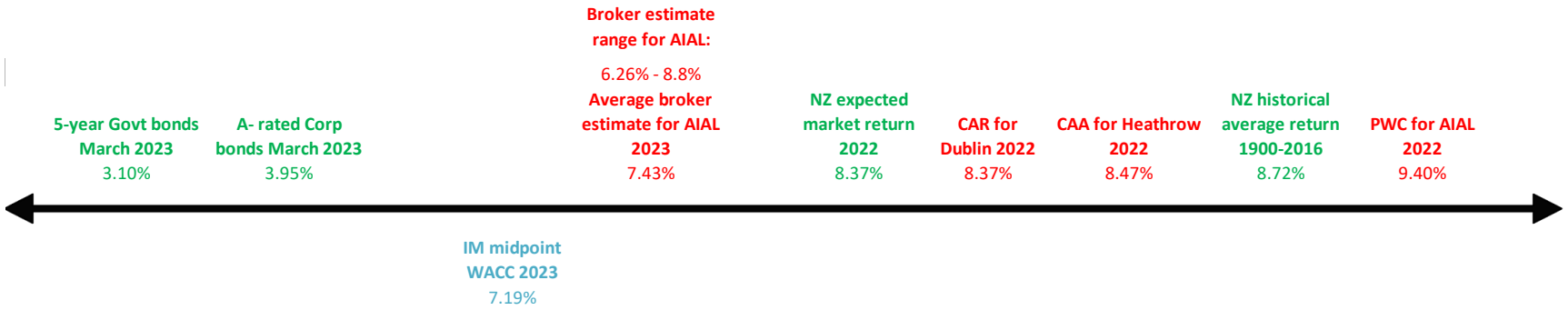


Our WACC estimates (as at 1st March 2023) are shown in blue, market information is shown in green, and estimates made by other parties (normalised to reflect the prevailing risk-free rate used in our own WACC estimates) are shown in red.

We note that Ofgem uses a TMR approach to the TAMRP, meaning that their TAMRP-equivalent depended on the risk-free rate at the time that the determination was made. Accordingly, it is not appropriate to combine it with a different risk-free rate for the purposes of estimating a WACC.

As noted in paragraph 7.9 above, we consider that New Zealand sourced WACC estimates should be given more weight than overseas estimates, given that international WACC estimates can be affected by country-specific factors (such as differences in tax regimes, monetary conditions, regulatory objectives and regimes, and investors' relative risk aversion).

Figure 7.2 Summary of WACC reasonableness checks for airports (using normalised risk-free rates)



Our WACC estimates (as at 1st March 2023) are shown in blue, market information is shown in green, and estimates made by other parties (normalised to reflect our estimate of the risk-free rate) are shown in red.

We note that both CAA and CAR use a TMR approach to the TAMRP, meaning that their TAMRP-equivalent depended on the risk-free rate at the time that the determination was made. Accordingly, it is not appropriate to combine it with a different risk-free rate for the purposes of estimating a WACC.

As noted in paragraph 7.9 above, we consider that New Zealand sourced WACC estimates should be given more weight than overseas estimates, given that international WACC estimates can be affected by country-specific factors (such as differences in tax regimes, monetary conditions, regulatory objectives and regimes, and investors' relative risk aversion).

Further details on reasonableness checks for EDBs, Transpower and GPBs

7.19 This section explains the comparative information used when assessing the reasonableness of our WACC estimates for EDBs and Transpower and GPBs in more detail. A summary of the information considered is contained in Figure 7.1.

Our WACC estimate for EDBs/Transpower and GPBs as at 1st March 2023

7.20 Our WACC estimates for EDBs, Transpower and GPBs calculated using the draft amended cost of capital IM are shown in Table 7.1 and Table 7.2. The figures are based on the draft amended cost of capital IMs contained in this decision. The risk-free rate is calculated as at 1st March 2023.

Table 7.1 WACC estimate for EDBs and Transpower as at 1st March 2023

Parameter	Estimate	Standard error
Risk-free rate (as at 1 March 2023)	4.31%	
Debt premium[329]	1.51%	0.0015
Leverage	41%	
Asset beta	0.35	0.12
Debt beta	0	
TAMRP	7.00%	0.015
Corporate tax rate	28%	
Investor tax rate	28%	
Debt issuance costs	0.20%	
Equity beta	0.59	
Cost of equity	7.23%	
Cost of debt	6.02%	
Vanilla WACC (mid-point)	6.74%	0.0101
Vanilla WACC (65th percentile)	7.12%	
Post-tax WACC (mid-point)	6.04%	0.0101
Post-tax WACC (65th percentile)	6.43%	

[329] The debt premium for EDBs and Transpower is from our most recent cost of capital determination: Commerce Commission " Cost of capital determination for disclosure year 2023 for information disclosure regulation - For Transpower, gas pipeline businesses and suppliers of specified airport services (with a June year-end)" (02 August 2022).

Table 7.2 WACC estimate for GPBs as at 1st March 2023

Parameter	Estimate	Standard error
Risk-free rate (as at 1 March 2023)	4.31%	
Debt premium[330]	1.43%	0.0015
Leverage	41%	
Asset beta	0.4	0.12
Debt beta	0	
TAMRP	7.00%	0.015
Corporate tax rate	28%	
Investor tax rate	28%	
Debt issuance costs	0.20%	
Equity beta	0.68	
Cost of equity	7.86%	
Cost of debt	5.94%	
Vanilla WACC (mid-point)	7.07%	0.0105
Post-tax WACC (mid-point)	6.39%	0.0105

7.21 As noted in paragraph 7.17 above, our reasonableness checks analysis focusses on our 65th percentile post-tax WACC estimate of 6.43% for EDBs and Transpower and mid-point post-tax WACC estimate of 6.39% for GPBs. We consider it is appropriate to focus on the 65th percentile estimate for EDBs and Transpower and mid-point WACC estimate for GPBs, given that these are the WACC estimates used when setting PQ paths for EDBs, Transpower and GPBs.

The plausible range

7.22 Our 65th percentile post-tax WACC estimate of 6.43% for EDBs/Transpower and mid-point post-tax WACC estimate of 6.39% for GPBs are within the plausible range we have considered, which is bounded:

7.22.1 at the lower end, by post-tax returns on five-year government bonds of 3.10% and five-year BBB+ rated corporate bond of 4.19%; and

[330] Debt premium for GPBs is from our most recent cost of capital determination: Commerce Commission "Cost of capital determination for disclosure year 2023 for information disclosure regulation - For Transpower, gas pipeline businesses and suppliers of specified airport services (with a June year-end)" (02 August 2022).

7.22.2 at the upper end, by the future return expected from the New Zealand market for a firm of average risk of 8.37% (which we have estimated using the CAPM) and long-term historical average returns of the New Zealand market overall of 8.72%.

7.23 Our WACC estimates for EDBs and Transpower and GPBs are below estimates of the post-tax WACC for a New Zealand firm of average risk, which is consistent with our expectations. Suppliers of essential services, such as EDBs, Transpower and GPBs are low risk businesses. Therefore, equity investors would expect to earn a lower return on these businesses than a New Zealand company of average risk.

7.24 We have estimated a future return expected from the market (using the SBL-CAPM) of 8.37%, as at the 1st of March. By definition, the market has an average equity beta of 1. Our analysis assumes a TAMRP of 7%, market-wide leverage of 30%, a risk-free rate of 4.31%, a debt premium of 1.51%, debt issuance costs of 0.20% per annum and a corporate and investor tax rate of 28%.[331]

7.25 PwC's most recent nominal post-tax WACC estimate for utilities was 8.30%.[332] This results in an average WACC estimate for utilities and Vector of 8.60%, when adjusting for our risk-free rate of 4.31% (instead of PwC's risk-free rate of 3.9%).

7.26 We have estimated the historical average return for the New Zealand market from 1900-2016 as 8.72%, based on data from Dimson, Marsh and Staunton (2017).[333, 334] Dimson, Marsh and Staunton are generally regarded as having produced the most authoritative source of historical returns to investors, and their data for New Zealand covers over 100 years. The advantage of looking at historical returns is that they can be calculated without the need for an analytical tool such as CAPM.

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[331] For simplicity, we have used our BBB+ debt premium estimate for EDBs and Transpower of 1.51% when estimating the future return expected from the market.

[332] PwC New Zealand "Cost of Capital Report 2022" (June 2022).

[333] Dimson, Marsh and Staunton estimate an average real (pre-tax) return to New Zealand equity investors of 6.2%, and a return on Government bonds of 2.1%, over the period from 1900-2016. The return on corporate debt is not calculated by Dimson, Marsh and Staunton, but for the purposes of this analysis we have assumed it falls midway between the return on government debt and the average for NZ equities (4.15%). Assuming an average inflation rate of 3.6%, a corporate tax rate of 28%, market-wide leverage of 30%, and no investor taxes on equity returns, this implies a post-tax WACC estimate of around 8.72% for an investment of average risk.

[334] Dimson, Marsh and Staunton, "Credit Suisse Global Investment Returns Yearbook 2017" (February 2017).

New Zealand-sourced estimates of the cost of capital for regulated suppliers

7.27 As part of our reasonableness checks, we have considered independent post-tax WACC estimates for New Zealand electricity lines and gas pipeline businesses. We have surveyed New Zealand investment banks including Forsyth Barr, Jarden, and UBS in early 2023 regarding their estimates for Vector.

7.28 After normalising the differences in risk-free rates, we consider that our 65th percentile post-tax WACC estimate of 6.43% for EDBs and Transpower and mid-point post-tax WACC estimate of 6.39% for GPBs are reasonable given they are:

7.28.1 within the range of brokers estimates for Vector's regulated business (ranged from 5.92% to 6.45%); but

7.28.2 below the PwC WACC estimate for Vector of 7.50%.

Overseas estimates of the regulated cost of capital

7.29 We have also considered recent regulatory decisions regarding the cost of capital made by the AER in Australia, and Ofgem in UK. To enable comparison with our post-tax WACC estimates, we have converted:

7.29.1 the AER's MRP to TAMRP (assuming investor tax rate is the same as the corporate tax rate of 30%), then converted AER's WACC estimates to nominal post-tax WACC, and finally substituted in our risk-free rate estimate of 4.31%[335]; and

7.29.2 Ofgem's real vanilla WACC estimates to nominal post-tax WACC estimates (assuming an inflation rate of 2% for electricity distribution and 2.02% for electricity transmission, gas distribution and transmission, and a tax rate of 25%), and then substituted in our risk-free rate estimate of 4.31%.[336]

Table 7.3 Overseas WACC estimates for energy businesses

Determination	Year	Normalised WACC estimate (nominal, post-tax)
AER 2022 RORI WACC	2023	5.56%
RIIO-ED2 – electricity distribution (2023-2028)	2022	5.96%
RIIO-T2 – electricity transmission (2021-2026)	2020	7.46%
RIIO-GD/T2 – gas transmission and distribution (2021-2026)	2020	7.46%

[335] AER "Rate of Return Instrument Explanatory Statement" (February 2023).

[336] Ofgem "RIIO-2 Final Determinations – Finance Annex (REVISED)" (03 February 2021), para 3.23.

7.30 As shown in Table 7.3, the recent AER WACC estimate of 5.56% for energy businesses is below our 65th percentile post-tax WACC estimate of 6.43% for EDBs/Transpower and mid-point post-tax WACC estimate of 6.39% for GPBs.

7.31 As shown in Table 7.3, our 65th percentile post-tax WACC estimate of 6.43% for EDBs/Transpower and mid-point post-tax WACC estimate of 6.39% for GPBs are within the range of recent Ofgem WACC estimates for electricity distribution, electricity transmission, gas distribution, and gas transmission (after normalising for differences in risk-free rates).

Further details on reasonableness checks for airports

7.32 This section explains the comparative information used when assessing the reasonableness of our WACC estimate for airports in more detail. A summary of the information considered is contained in Figure 7.2.

Our WACC estimate for specified airport services as at 1st March 2023

7.33 Our WACC estimate for airports is shown in Table 7.4. The figures are based on the draft amended cost of capital IMs contained in this decision. The risk-free rate is calculated as at the 1st of March 2023.

Table 7.4 WACC estimate for airport as at 1st March 2023

Parameter	Estimate	Standard error
Risk-free rate (as at 1st March 2023)	4.31%	
Debt premium[337]	1.17%	0.0015
Leverage	26%	
Asset beta	0.55	0.18
Debt beta	0	
TAMRP	7.00%	0.015
Corporate tax rate	28%	
Investor tax rate	28%	
Debt issuance costs	0.20%	
Equity beta	0.74	
Cost of equity	8.28%	
Cost of debt	5.68%	
Vanilla WACC (mid-point)	7.61%	0.0153
Post-tax WACC (mid-point)	7.19%	0.0153

7.34 As noted in paragraph 7.18 above, our reasonableness checks analysis focusses on our mid-point post-tax WACC estimate for airport of 7.19%. This is because we publish a mid-point WACC estimate for airports (along with the standard error of the WACC, which can be used to calculate different percentile estimates).

The plausible range

7.35 Our mid-point post-tax WACC estimate for airports of 7.19% is within the plausible range we have considered, which is bounded:

7.35.1 at the lower end, by post-tax returns on five-year government bonds of 3.10% and five-year A- rated corporate bond of 3.95%; and

7.35.2 at the upper end, by the future return expected from the New Zealand market for a firm of average risk of 8.37% (which we have estimated using the CAPM) and long-term historical average returns of the New Zealand market overall of 8.72%.

[337] Debt premium for airports is from our most recent Cost of capital determination: Commerce Commission "Cost of capital determination for disclosure year 2023 for information disclosure regulation" (2 August 2022).

7.36 Our WACC estimate for airports is below estimates of the post-tax WACC for a New Zealand firm of average risk, which is consistent with our expectations. Regulated airport services have below average risk, given that they have considerable pricing power, and have users with limited alternatives (although we also note they are exposed to a number of demand risks which are a function of systematic factors).

7.37 We have estimated a future return expected from the market (using the SBL-CAPM) of 8.37%, as at 1st March. By definition, the market has an average equity beta of 1. Our analysis assumes a TAMRP of 7%, market-wide leverage of 30%, a risk-free rate of 4.31%, a debt premium of 1.51%, debt issuance costs of 0.20% per annum and a corporate and investor tax rate of 28%.[338]

7.38 We have estimated the historical average return for the New Zealand market from 1900-2016 as 8.72%, based on data from Dimson, Marsh and Staunton (2017).[339] [340] Dimson, Marsh and Staunton are generally regarded as having produced the most authoritative source of historical returns to investors, and their data for New Zealand covers over 100 years. The advantage of looking at historical returns is that they can be calculated without the need for an analytical tool such as the CAPM.

New Zealand-sourced estimates of the cost of capital for regulated suppliers

7.39 As part of our reasonableness checks, we have considered alternative post-tax WACC estimates for New Zealand airports. We have surveyed New Zealand investment banks including Craigs Investment Partners, Forsyth Barr, Jarden, Macquarie, and UBS in early 2023 regarding their estimates for AIAL.

7.40 After normalising for differences in risk-free rates, we consider that our mid-point post-tax WACC estimate for airports of 7.19% is reasonable given it is:

7.40.1 within the range of brokers estimates for AIAL's aeronautical services (which range from 6.26% to 8.80%); but

7.40.2 below PwC's estimate for AIAL of 9.40%.

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[338] For simplicity, we have used our BBB+ debt premium estimate for EDBs and Transpower of 1.51% when estimating the future return expected from the market.

[339] Dimson, Marsh and Staunton estimate an average real (pre-tax) return to New Zealand equity investors of 6.2%, and a return on Government bonds of 2.1%, over the period from 1900-2016. The return on corporate debt is not calculated by Dimson, Marsh and Staunton, but for the purposes of this analysis we have assumed it falls midway between the return on government debt and the average for NZ equities (4.15%). Assuming an average inflation rate of 3.6%, a corporate tax rate of 28%, market-wide leverage of 30%, and no investor taxes on equity returns, this implies a post-tax WACC estimate of around 8.72% for an investment of average risk.

[340] Dimson, Marsh and Staunton, "Credit Suisse Global Investment Returns Yearbook 2017" (February 2017).

Overseas estimates of the regulated cost of capital

7.41 We have also considered recent regulatory decisions regarding the cost of capital for airports made by the UK CAA, and the CAR in Ireland. To enable comparison with our mid-point post-tax WACC estimate, we have converted:

7.41.1 the CAA's real vanilla WACC estimate to a nominal post-tax WACC estimate (assuming an inflation rate of 4.56% and a tax rate of 23.5%), and then substituted in our risk-free rate estimate of 4.31%;[341] and

7.41.2 the CAR's real pre-tax WACC estimate to a nominal post-tax WACC estimate (assuming an inflation rate of 2.67% and a tax rate of 12.5%), and then substituted in our risk-free rate estimate of 4.31%.[342]

7.42 We noted that both regulators use a TMR approach to the TAMRP, meaning that their TAMRP-equivalent depended on the risk-free rate at that time that the determination was made. Accordingly, it is not appropriate to combine it with a different risk-free rate for the purposes of estimating a WACC.

7.43 As shown in Table 7.5, our mid-point WACC estimate for airports of 7.19% is below the CAA and the CAR estimates (after normalising for differences in risk-free rates).

Table 7.5 Overseas WACC estimates for airports

Determination	Year	Normalised WACC estimate
CAA estimate for Heathrow	2022	8.47%
CAR estimate for Dublin	2022	8.37%

We have also considered RAB multiples evidence, as a secondary reasonableness check

7.44 As part of our reasonableness checks, we have considered RAB multiples for regulated energy and airport businesses in New Zealand. RAB multiples can provide a useful indicator of whether the allowed rate of return has been set at a sufficient level to adequately compensate investors for putting their capital at risk.

[341] CAA "Economic regulation of Heathrow Airport Limited: H7 Final Proposals Section 3: Financial issues and implementation" (June 2022); and CAA "Economic regulation of Heathrow Airport Limited: H7 Initial Proposals Section 2: Financial issues" (October 2021).

[342] Swiss Economics "Dublin Airport Cost of Capital for 2022 Interim Review Final report: A report for the Commission for Aviation Regulation" (December 2022).

7.45 The RAB multiple of a regulated business is the ratio of its enterprise value to its RAB. The ratio tells us the market value for each dollar of the utility's RAB. At its simplest, the concept is whether (in absence of other factors) a regulated business will deliver returns close to its 'true' cost of capital. That is, the net present value of expected cash-flows should, if the regulator's assumptions hold, equal the value of the RAB (ie., the RAB multiple should be 1).

7.46 However, in an incentive-based regulatory regime, the RAB multiple will not only reflect the relationship between the regulatory allowed rate of return and investors' views of WACC, but also the market's expectations of the company's ability to over or under-perform relative to the regulator's cash-flow allowance and other modelling assumptions. On this basis, a RAB multiple greater than 1.0 could imply either:

7.46.1 the regulatory allowed rate of return was too high; or

7.46.2 the market expected the company to outperform relative to the allowed cash-flow or other model assumptions used in the regulatory determination.

Summary of RAB multiples evidence we have considered

7.47 We have considered recent evidence regarding RAB multiples for businesses subject to regulation under Part 4 of the Act. In particular, RAB multiples are able to be calculated for:

7.47.1 the sale of Eastland Network to First Gas Group, which was announced in November 2022 and completed in March 2023; and

7.47.2 regulated businesses that are publicly listed, specifically Vector and AIAL.

7.48 Given that Vector and AIAL are publicly listed, we have simply reported RAB multiples estimated by research analysts at the New Zealand investment banks. For Eastland Network, we have estimated RAB multiple ourselves based on publicly available information regarding the recent transaction affecting the company.

7.49 The RAB multiples evidence we have considered is summarised in Table 7.6:

Table 7.6 Summary of RAB multiples for regulated energy businesses and airports[343]

	RAB multiple
Energy businesses	
Eastland Group sale of Eastland Network to First Gas - Commerce Commission estimate	1.38x
Vector – Jarden estimates	1.23x for EDBs 1.00x for GDBs
Vector – UBS estimate	1.3x
Airports	
AIAL – Forsyth Barr estimate	1.9x
AIAL – UBS estimate	1.3x

7.50 We note that Forsyth Barr's estimated RAB multiple for Auckland International Airport is high. However, the UBS estimate is similar to the RAB multiple estimates for energy businesses.

7.51 We consider that the available RAB multiples for EDBs and airports (as shown in Table 7.6 above) do not raise concerns about the reasonableness of our WACC estimates for these sectors. The observed multiples, which are generally significantly in excess of one, suggest the current regulatory settings are more than sufficient to compensate investors for putting their capital at risk. This conclusion is likely to hold under our draft amended cost of capital IMs, given that we are not proposing to make material changes to our approach to estimating WACC for these sectors.

7.52 Jarden's estimate of a RAB multiple of 1.00 for Vector's gas assets reflects uncertainty around the long-term outlook for the sector and the regulatory settings leading up to switch-off. As such, their estimate of a RAB multiple of 1.00 is due to factors other than our current WACC parameters.

7.53 We acknowledge that there are limitations of our RAB multiples analysis. For example, as noted in our 2014 WACC percentile decision:[344]

[343] We have surveyed research analysts at the New Zealand investment banks in early 2023 regarding their RAB multiples for Vector and AIAL.

[344] Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services – Reasons paper" (30 October 2014), para 6.35.

7.53.1 there are only a limited number of data points available;

7.53.2 there are a range of factors which could potentially influence RAB multiples (in addition to the allowed rate of return), including outperformance of opex and capex benchmarks; and

7.53.3 it can be difficult to isolate the enterprise value of the regulated activities of a business, due to uncertainty over the value of unregulated activities.

7.54 However, despite these limitations, we consider that the observed RAB multiples provide a useful indicator regarding the overall reasonableness of the regulatory settings (including the allowed WACC).

How we estimated the RAB multiples for Eastland Network

7.55 We have estimated the RAB multiple for Eastland Network based on publicly available information regarding the recent transaction. Table 7.7 summarises our RAB multiples calculations for Eastland Network.

Table 7.7 Eastland Network RAB multiple

	Measurement dates	RAB multiple
Enterprise value of regulated utility ($m)		
Enterprise value based on sale price	November 2022	$260m
Less: capital work in progress	March 2022	$1.1m
Total		$258.9m
RAB ($m)	March 2022	$188.0m
EV/RAB		1.38x

Source: Publicly available information and Commerce Commission analysis

7.56 The RAB multiple we have estimated for Eastland Network sale is based on the assumptions set out below:

7.56.1 The sale price of $260m is used as the enterprise value for the regulated business.[345] We have assumed there are no unregulated businesses to be subtracted.

7.56.2 We have removed capital works in progress of $1.1m from the enterprise value, given that RAB values do not include capital work in progress (ie, assets are only included in RAB once they are commissioned).

7.56.3 Eastland Network's closing RAB as at 31st March 2022 was $188.0m.[346]

[345] In November 2022 it was announced that First Gas Group, owned by Igneo Infrastructure Partners, would buy Eastland Network for $260 million: Eastland Group "Eastland Group and shareholder Trust Tairāwhiti announce sale of Eastland Network to First Gas Group, owned by Igneo Infrastructure Partners, for $260 million" (22 November 2022).

[346] Eastland Network "Annual disclosures for the disclosure year ending 31st March 2022" (March 2022).

Attachment A Airport comparator sample (Cost of capital Equity beta)

Table A1 Reasons for selecting firms in the airport comparator sample[347]

Ticker	Name	Asset beta variability 2012-2017	Asset beta variability 2017-2022	Bid-ask spread	Free float	Leverage	MRP	Country classification	Reason for inclusion/exclusion
Companies included from the CEPA sample									
694 HK Equity	Beijing Capital International	0.16	0.18	0.33%	100.00%	0.13	6.5%	Developed	No reason to reject
ADP FP Equity	Aeroports de Paris	0.02	0.15	0.10%	36.06%	0.31	6.3%	Developed	No reason to reject
AENA SM Equity	AENA	0.00	0.06	0.08%	46.06%	0.24	NA	Developed	No reason to reject
AIA NZ Equity	Auckland International Airport	0.11	0.08	0.11%	81.89%	0.16	5.7%	Developed	No reason to reject
FHZN SW Equity	Flughafen Zuerich AG	0.11	0.16	0.12%	61.49%	0.16	5.8%	Developed	No reason to reject
FLU AV Equity	Flughafen Wien AG	0.10	0.05	0.77%	10.00%	0.09	5.8%	Developed	No reason to reject
FRA GR Equity	Fraport AG Frankfurt Airport S	0.02	0.11	0.15%	39.85%	0.49	5.7%	Developed	No reason to reject
SYD AU Equity	Sydney Airport	0.15	0.18	NA	NA	0.35	6.3%	Developed	Delisting not strong reason to reject given proximity and comparability of market to NZ
Companies excluded from the CEPA sample									

[347] Leverage beta estimate variation calculated internally, MRP from Fernandez survey: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3803990, bid-ask spread as reported in Qantas submission and also calculated internally from Bloomberg, country classification from FTSE Equity Country Classification as reported in Qantas submission but available from https://research.ftserussell.com/products/downloads/FTSE-Country-Classification-Update_latest.pdf.

Ticker	Name	Asset beta variability		Bid-ask spread	Free float	Leverage	MRP	Country classification	Reason for inclusion/exclusion
		2012-2017	2017-2022						
000089 CH Equity	Shenzhen Airport Co	0.09	0.19	0.14%	42.17%	-0.02	8.7%	Secondary emerging	Market comparability, negative leverage
ADB IM Equity	Aeroporto Guglielmo Marconi di Bologna	NA	0.33	1.17%	21.52%	0.03	6.0%	Developed	Beta estimate unreliable, liquidity
357 HK Equity	HNA Infrastructure Company Ltd	0.02	0.11	0.63%	77.31%	0.22	6.5%	Developed	Liquidity
600004 CH Equity	Guangzhou Baiyun International	0.12	0.27	0.09%	42.43%	0.01	8.7%	Secondary emerging	Beta estimate unreliable, market comparability
600009 CH Equity	Shanghai International Airport	0.17	0.41	0.03%	32.17%	-0.03	8.7%	Secondary emerging	Beta estimate unreliable, market comparability, negative leverage
600897 CH Equity	Xiamen International Airport C	0.02	0.24	0.10%	28.86%	-0.24	8.7%	Secondary emerging	Beta estimate unreliable, market comparability, negative leverage
AOT TB Equity	Airports of Thailand PCL	0.02	0.26	0.36%	28.35%	-0.02	7.0%	NA	Market comparability, beta estimate unreliable, negative leverage
ASURB MM Equity	Grupo Aeroportuario del Surest	0.07	0.21	0.15%	40.90%	0.08	7.4%	Advanced emerging	Market comparability, beta estimate unreliable
GAPB MM Equity	Grupo Aeroportuario del Pacifi	0.14	0.29	0.14%	87.60%	0.07	7.4%	Advanced emerging	Market comparability, beta estimate unreliable
GMRI IN Equity	GMR Infrastructure Ltd	0.07	0.07	0.11%	35.37%	0.62	6.9%	Secondary emerging	Market comparability
KBHL DC Equity	Kobenhavns Lufthavne	0.20	0.08	1.14%	1.40%	0.16	5.8%	Developed	Liquidity

Ticker	Name	Asset beta variability		Bid-ask spread	Free float	Leverage	MRP	Country classification	Reason for inclusion/exclusion
		2012-2017	2017-2022						
MAHB MK Equity	Malaysia Airports Holdings Bhd	0.50	0.26	0.18%	37.55%	0.25	7.0%	Advanced emerging	Beta estimate unreliable
MIA MV Equity	Malta International Airport PL	0.71	0.46	NA	69.90%	0.01	NA	Frontier	Beta estimate unreliable
OMAB MM Equity	Grupo Aeroportuario del Centro	0.39	0.34	0.14%	80.59%	0.04	7.4%	Advanced emerging	Market comparability, beta estimate unreliable
TYA IM Equity	Toscana Aeroporti SpA	0.27	0.26	2.64%	26.90%	0.18	6.0%	Developed	Liquidity, beta estimate unreliable

Table A2 Asset betas for airport comparator sample by period and frequency

	2007-2012	2012-2017	2017-2022	2018-2020	2020-2022
Daily	0.51	0.47	0.67	0.58	0.71
Weekly	0.56	0.47	0.78	0.61	0.86
Four-weekly	0.58	0.49	0.77	0.52	0.77
Average (weekly and 4 weekly)	0.57	0.48	0.77	0.57	0.81

Table A3 Asset betas for airport comparator sample by firm, period and frequency

Airport sample	Name	1996-2001			2001 -2006			2007-2012			2012-2017			2017-2022		
		Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly
694 HK Equity	Beijing Capital International	0.59	0.11	0.08	0.91	0.88	0.89	0.63	0.68	0.62	0.48	0.50	0.64	0.65	0.83	0.82
ADP FP Equity	Aeroports de Paris	-	-	-	-	-	-	0.58	0.61	0.57	0.40	0.41	0.43	0.70	0.85	0.83
AENA SM Equity	AENA	-	-	-	-	-	-	-	-	-	-	-	-	0.78	0.79	0.84
AIA NZ Equity	Auckland International Airport	0.58	0.34	0.46	0.83	0.87	0.82	0.77	0.69	0.67	1.00	0.97	0.90	1.01	1.06	0.99
FHZN SW Equity	Flughafen Zuerich AG	0.14	0.14	0.37	0.09	0.10	0.28	0.35	0.53	0.65	0.51	0.54	0.62	0.70	0.86	0.86

FLU AV Equity	Flughafen Wien AG	-	-	-	0.67	0.48	0.88	0.31	0.40	0.41	0.20	0.22	0.30	0.57	0.59	0.55
FRA GR Equity	Fraport AG Frankfurt Airport S	-	-	-	0.31	0.51	0.61	0.51	0.59	0.60	0.32	0.34	0.33	0.46	0.57	0.58
SYD AU Equity	Sydney Airport	-	-	-	0.90	0.44	0.62	0.44	0.41	0.50	0.40	0.33	0.24	0.52	0.70	0.67
Average		0.44	0.20	0.31	0.62	0.55	0.68	0.51	0.56	0.58	0.47	0.47	0.49	0.67	0.78	0.77

Attachment B Energy comparator sample (Cost of capital Equity beta)

Table B1 Reasons for selecting firms in the energy comparator sample

Ticker	Name	Asset beta variability		Bid-ask spread	Free float %	Leverage	Reason for exclusion/inclusion
		2012-2017	2017-2022				
Companies included in our comparator sample							
AEE US Equity	Ameren Corp	0.03	0.11	0.04%	99.36	0.36	No reason to exclude
AEP US Equity	American Electric Power Co Inc	0.09	0.04	0.03%	99.86	0.42	No reason to exclude
AES US Equity	AES Corp/VA	0.04	0.05	0.04%	97.90	0.61	No reason to exclude
ALE US Equity	ALLETE Inc	0.05	0.11	0.16%	99.57	0.31	No reason to exclude
APA AU Equity	APA Group	0.04	0.03	NA	NA	0.46	Relevant Australian comparator
AST AU Equity	AusNet Services	0.05	0.12	NA	NA	0.54	Australian firm delisted but relevant comparator
ATO US Equity	Atmos Energy Corp	0.08	0.09	0.08%	99.65	0.28	No reason to exclude
AVA US Equity	Avista Corp	0.07	0.11	0.08%	98.97	0.43	No reason to exclude
BKH US Equity	Black Hills Corp	0.08	0.08	0.13%	99.37	0.48	No reason to exclude
CMS US Equity	CMS Energy Corp	0.11	0.09	0.04%	99.50	0.42	No reason to exclude
CNA LN Equity	Centrica PLC	0.13	0.15	0.11%	99.99	0.31	No reason to exclude
CNP US Equity	CenterPoint Energy Inc	0.06	0.08	0.04%	99.57	0.46	No reason to exclude
D US Equity	Dominion Resources Inc/VA	0.08	0.09	0.03%	99.82	0.40	No reason to exclude
DTE US Equity	DTE Energy Co	0.12	0.02	0.05%	88.09	0.42	No reason to exclude

Ticker	Name	Asset beta variability		Bid-ask spread	Free float %	Leverage	Reason for exclusion/inclusion
		2012-2017	2017-2022				
DUE AU Equity	DUET Group	0.06	NA	NA	NA	NA	Australian firm delisted but relevant comparator
DUK US Equity	Duke Energy Corp	0.10	0.05	0.03%	99.81	0.48	No reason to exclude
ED US Equity	Consolidated Edison Inc	0.14	0.10	0.03%	99.85	0.44	No reason to exclude
EIX US Equity	Edison International	0.04	0.04	0.05%	99.91	0.47	No reason to exclude
ES US Equity	Eversource Energy	0.09	0.07	0.03%	99.01	0.38	No reason to exclude
ETR US Equity	Entergy Corp	0.03	0.03	0.06%	99.58	0.51	No reason to exclude
EVRG US Equity	Evergy Inc	0.00	0.08	0.06%	98.59	0.41	No reason to exclude
EXC US Equity	Exelon Corp	0.10	0.07	0.03%	98.85	0.46	No reason to exclude
FE US Equity	FirstEnergy Corp	0.11	0.08	0.03%	94.88	0.51	No reason to exclude
HE US Equity	Hawaiian Electric Industries I	0.07	0.23	0.09%	99.23	0.03	No reason to exclude
IDA US Equity	IDACORP Inc	0.05	0.07	0.16%	99.25	0.25	No reason to exclude
KMI US Equity	Kinder Morgan Inc/DE	0.14	0.06	0.06%	87.39	0.47	No reason to exclude
LNT US Equity	Alliant Energy Corp	0.07	0.02	0.04%	99.78	0.34	No reason to exclude
NEE US Equity	NextEra Energy Inc	0.09	0.03	0.02%	99.75	0.27	No reason to exclude
NFG US Equity	National Fuel Gas Co	0.07	0.03	0.10%	98.59	0.33	No reason to exclude
NG/ LN Equity	National Grid PLC	0.03	0.08	0.06%	99.96	0.48	No reason to exclude
NI US Equity	NiSource Inc	0.12	0.08	0.04%	99.52	0.49	No reason to exclude
NJR US Equity	New Jersey Resources Corp	0.15	0.12	0.11%	99.40	0.34	No reason to exclude

Ticker	Name	Asset beta variability		Bid-ask spread	Free float %	Leverage	Reason for exclusion/inclusion
		2012-2017	2017-2022				
NWE US Equity	NorthWestern Corp	0.09	0.15	0.13%	98.73	0.42	No reason to exclude
OGE US Equity	OGE Energy Corp	0.03	0.07	0.05%	99.58	0.34	No reason to exclude
OGS US Equity	One Gas Inc	0.27	0.15	0.13%	98.20	0.34	Possible liquidity concern due to asset beta variability
OKE US Equity	ONEOK Inc	0.14	0.33	0.04%	99.33	0.34	High asset beta variability; however bid ask spread is low
PCG US Equity	PG&E Corp	0.04	0.11	0.06%	90.40	0.57	No reason to exclude
PEG US Equity	Public Service Enterprise Grou	0.11	0.08	0.02%	99.80	0.36	No reason to exclude
PNM US Equity	PNM Resources Inc	0.12	0.04	0.03%	98.60	0.47	No reason to exclude
PNW US Equity	Pinnacle West Capital Corp	0.05	0.10	0.08%	99.68	0.41	No reason to exclude
POR US Equity	Portland General Electric Co	0.12	0.07	0.07%	99.37	0.39	No reason to exclude
PPL US Equity	PPL Corp	0.07	0.06	0.04%	97.72	0.44	No reason to exclude
SJI US Equity	South Jersey Industries Inc	0.03	0.09	NA	99.46	0.50	No reason to exclude
SO US Equity	Southern Co/The	0.12	0.05	0.02%	98.93	0.45	No reason to exclude
SR US Equity	Spire Inc	0.07	0.14	0.15%	96.99	0.45	No reason to exclude
SRE US Equity	Sempra Energy	0.02	0.05	0.07%	99.96	0.40	No reason to exclude
SSE LN Equity	SSE PLC	0.06	0.06	0.06%	99.94	0.38	No reason to exclude
SWX US Equity	Southwest Gas Corp	0.08	0.18	0.14%	96.43	0.41	No reason to exclude

Ticker	Name	Asset beta variability		Bid-ask spread	Free float %	Leverage	Reason for exclusion/inclusion
		2012-2017	2017-2022				
VCT NZ Equity	Vector Ltd	0.02	0.03	0.45%	24.89	0.43	Liquidity a possible concern but stable asset beta variability and only NZ firm
WEC US Equity	WEC Energy Group Inc	0.21	0.12	0.04%	99.84	0.33	No reason to exclude
XEL US Equity	Xcel Energy Inc	0.10	0.09	0.02%	99.74	0.39	No reason to exclude
Companies excluded from our comparator sample							
AGR US Equity	Avangrid Inc	0.45	0.05	0.09%	18.30	0.31	Liquidity - asset beta reliability and free float percentage
CPK US Equity	Chesapeake Utilities Corp	0.19	0.19	0.50%	96.98	0.28	Liquidity - bid-ask spread and asset beta reliability
MGEE US Equity	MGE Energy Inc	0.28	0.24	0.39%	99.74	0.16	Liquidity - beta reliability and bid-ask spread
NWN US Equity	Northwest Natural Gas Co	0.12	0.21	0.21%	98.81	0.38	Liquidity - beta variability and bid-ask spread
RGCO US Equity	RGCO	0.02	0.35	2.50%	79.39	0.33	Liquidity - bid ask spread and asset beta variability
UTL US Equity	Unitil Corp	0.12	0.22	0.78%	98.10	0.40	Liquidity - bid ask spread and asset beta variability

Table B2 Asset betas for energy comparator sample by period and frequency

	2007-2012	2012-2017	2017-2022	2018-2020	2020-2022
Daily	0.38	0.38	0.41	0.22	0.50
Weekly	0.35	0.35	0.40	0.20	0.50
Four-weekly	0.33	0.31	0.37	0.19	0.39
Average (weekly- and four-weekly)	0.34	0.33	0.38	0.20	0.44

Table B3 Results of test of whether there is a statistically significant difference between the means of the gas and non-gas samples (p-values)[348]

	2007-12	2012-17	2017-22	2018-20	2020-22	2021-22
Daily	0.219	0.019*	0.040*	0.002**	0.182	0.250
Weekly	0.329	0.024*	0.120	0.002**	0.387	0.320
Four-weekly	0.342	0.029*	0.164	0.012*	0.223	0.953

[348] The values reported in this table are p-values. A p-value is a measure of evidence against the null hypothesis. In this case, the null hypothesis is that there is no significant difference between the means of the gas and non-gas samples. A single asterisk indicates there is evidence against the null hypothesis at the 0.05 level of significance; two asterisks indicate evidence at the 0.01 level of significance; three asterisks indicate evidence at the 0.001 level of significance. The more asterisks there are, the more confidence can be placed on a conclusion that the gas sample can be separated from the non-gas sample. It is common practice to use at least one asterisk as the level of evidence required to be confident that the means of two samples are statistically different. These results are generated using the t.test function in the package R.

Table B4 Results of test of whether there is a statistically significant difference between the means of the gas and non-gas samples (p-values) excluding ONEOK

	2007-12	2012-17	2017-22	2018-20	2020-22	2021-22
Daily	0.305	0.040*	0.051	0.001**	0.372	0.399
Weekly	0.462	0.051	0.196	0.002**	0.915	0.486
Four-weekly	0.510	0.062	0.313	0.020*	0.443	0.813

Table B5 Results of test of whether there is a statistically significant difference between the means of the gas and electricity samples (p-values)

	2007-12	2012-17	2017-22	2018-20	2020-22	2021-22
Daily	0.275	0.016*	0.132	0.001**	0.694	0.423
Weekly	0.512	0.023*	0.220	0.001**	0.752	0.596
Four-weekly	0.620	0.031*	0.249	0.004**	0.578	0.582

Table B6 Results of test of whether there is a statistically significant difference between the means of the electricity and non-electricity samples (p-values)

	2007-12	2012-17	2017-22	2018-20	2020-22	2021-22
Daily	0.731	0.098	0.755	0.021*	0.255	0.790
Weekly	0.744	0.121	0.887	0.005**	0.286	0.534
Four-weekly	0.494	0.219	0.922	0.003**	0.443	0.199