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Input methodologies review draft decisions

Topic paper 4: Cost of capital issues

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Associated documents

Publication date	Reference	Title
16 June 2016	978-1-869455-08-8	Input methodologies review draft decisions: Summary paper
16 June 2016	978-1-869455-09-5	Input methodologies review draft decisions: Introduction and process paper
16 June 2016	978-1-869455-10-1	Input methodologies review draft decisions: Framework for the IM review
16 June 2016	978-1-869455-11-8	Input methodologies review draft decisions: Topic paper 1 – Form of control and RAB indexation for EDBs, GPBs and Transpower
16 June 2016	978-1-869455-18-7	Input methodologies review draft decisions: Topic paper 2 – CPP requirements
16 June 2016	978-1-869455-12-5	Input methodologies review draft decisions: Topic paper 3 – The future impact of emerging technologies in the energy sector
16 June 2016	978-1-869455-14-9	Input methodologies review draft decisions: Topic paper 5 – Airports profitability assessment
16 June 2016	978-1-869455-15-6	Input methodologies review draft decisions: Topic paper 6 – WACC percentile for airports
16 June 2016	978-1-869455-17-0	Input methodologies review draft decisions: Topic paper 7 – Related party transactions
22 June 2016 (expected)	978-1-869455-16-3	Input methodologies review draft decisions: Report on the IM review
22 June 2016 (expected)	1178-2560	Draft amendments to *Electricity Distribution Services Input Methodologies Determination 2012* [2012] NZCC 26
22 June 2016 (expected)	1178-2560	Draft amendments to *Gas Distribution Services Input Methodologies Determination 2012* [2012] NZCC 27
22 June 2016 (expected)	1178-2560	Draft amendments to *Gas Transmission Services Input Methodologies Determination 2012* [2012] NZCC 28
22 June 2016 (expected)	1178-2560	Draft amendments to *Commerce Act (Specified Airport Services Input Methodologies) Determination 2010* (Decision 709, 22 December 2010)
22 June 2016 (expected)	1178-2560	Draft amendments to *Transpower Input Methodologies Determination 2012* [2012] NZCC 17

Commerce Commission
Wellington, New Zealand

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Executive summary

Purpose of paper

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

X1.1 the issues we have identified within this topic area;

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

X1.3 the reasons for our proposed responses;

X1.4 the steps we have taken to ensure that all the parameters remain fit for purpose given changes in the overall environment faced by suppliers since the IMs were originally set; and

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

X2. This paper relates to electricity distribution businesses, gas transmission business, gas distribution businesses, Transpower and regulated airports.

Overview of the cost of capital topic

X3. We have reviewed our the of capital IM and consider it remains broadly fit for purpose. Our review included:

X3.1. re-examining the case for a trailing average cost of debt in response to the substantive stakeholder submissions on this;

X3.2. examining a proposal by the Major Electricity Users' Group (**MEUG**) for a cross-check with the Black's Simple Discounting Rule;

X3.3. examining the issues raised by the High Court (ie, alternative models, split cost of capital, and the term credit spread differential (**TCSD**));

X3.4. considering whether any adjustment to beta is required in light of our proposed changes to the form of control for electricity distribution businesses (**EDB**s); and

X3.5. reviewing key parameter estimates such as tax adjusted market risk premium (**TAMRP**) and beta in light of updated information.

X.4. Table X1 summarises the areas in this topic where our analysis has led us to proposed changes to the IMs, and the reasons for those changes. As can be seen in the table, we have primarily made changes that lead to a better estimate of weighted average cost of capital (**WACC**) as we consider that the more accurate our estimate of WACC, the better we are able to promote the purpose of Part 4 (**Part 4**) of the Commerce Act 1986 (**the Act**). There are other issues that we have considered in relation to this topic which have not resulted in changes. These issues are discussed as part of the following chapters in this paper.

Table X1: Summary of proposed changes in relation to the cost of capital

Proposed change	Outcomes of the proposed change	Chapter
Continue to use the prevailing risk-free rate, but use three months of data instead of one month.	We consider that prevailing rates still better achieve the Part 4 purpose and the potential dynamic efficiency benefits of investment, than the use of historic rates. However, it is possible that the one month window may have some distortionary effects in the way suggested by submissions, so we propose to increase the determination window.	This proposed change is discussed in Chapter 3.
Modify the debt premium methodology implementation by: • using three months of data instead of one month; • removing the government ownership limitation on relevant bonds; and • having regard to the Nelson-Siegel-Svensson (**NSS**) curve when estimating the debt premium;	Removing the government ownership limitation increases the size of the core sample of bonds used to determine our debt premium estimate, helping alleviate difficulties associated with the small pool of relevant corporate bonds that we currently rely on. A more mechanical approach reduces the degree of judgement required when determining our debt premium estimates.	This proposed change is discussed in Chapter 3.
Change issuance costs from 35 basis points (**bps**) (0.35%) p.a. to 20 bps (20%) p.a.	The High Court suggested that the existing assumption of 0.35% p.a. for issuance costs is likely to be generous in terms of issuing NZ domestic corporate bonds. We consider, on the basis of the evidence now available, that an allowance for debt issuance costs of 20 bps is sufficient to cover the costs of issuing NZ domestic corporate bonds and the costs of any required swaps. As a result, we consider that this proposed change improves the accuracy of our	This proposed change is discussed in Chapter 3.

	estimate of the cost of capital.	
Remove an allowance for swap costs from the TCSD and include it as part of the debt issuance costs.	Reduces the complex administrative burden on suppliers.	This proposed change is discussed in Chapter 3.
Change the asset beta upwards adjustment for GPBs – from 0.1 to 0. Therefore, change the asset beta estimate for GPBs – from 0.44 to 0.34.	After examining the available evidence, we currently consider that there is no strong case for applying different asset betas for electricity lines and gas pipeline services. We have weighed the pros and cons of applying an asset beta uplift for GPBs and consider that, on balance, not including an uplift will better promote the s 52A purpose.	This proposed change is discussed in Chapter 4.
Change the leverage estimate for EDBs and GPBs – from 44% to 41%.	We have updated our comparator sample to obtain a more accurate estimate of asset beta. We continue to use the average leverage of the comparator sample, which has also been updated.	This proposed change is discussed in Chapter 4.
Change the leverage estimate for airports – from 17% to 19%.	We have updated our comparator sample to obtain a more accurate estimate of asset beta. We continue to use the average leverage of the comparator sample, which has also been updated.	This proposed change is discussed in Chapter 4.
Change the asset beta estimate for airports – from 0.60 to 0.58.	We have updated our comparator sample to obtain a more accurate estimate of asset beta. The reduction in asset beta reflects the observed reduction in average asset beta in our sample, relative to our 2010 decision.	This proposed change is discussed in Chapter 4.
Use a fixed linear relationship to determine the additional debt premium associated with debt issued with an original maturity term of more than five years.	There is no longer a requirement to obtain market information when estimating the TCSD, which reduces the complexity of the TCSD. It will always provide a positive relationship between the TCSD allowance and original term of the debt, which ensures that the intent of the TCSD (that additional compensation is provided for issuing longer-term debt) is met.	This proposed change is discussed in Chapter 3.

X5. This topic paper forms part of our package of draft decisions papers on the IM review. As part of the package of papers, we have also published:

X5.1 a summary paper of our draft decisions;

X5.2 an introduction and process paper, which provides an explanation of how the papers in our draft decisions package fit together; and

X5.3 a framework paper, which explains the framework we have applied in reaching our draft decisions on the IM review.

Invitation to make submissions

X6. We invite submissions on this paper by **5pm on 28 July 2016**. We then invite cross submissions by **5pm on 11 August 2016**.

X7. Please address submissions and cross submissions to:

Keston Ruxton
Manager, Input Methodologies Review
Regulation Branch
im.review@comcom.govt.nz

X8. Please clearly indicate within your submission which aspects of this paper it relates to.

Chapter 1: Introduction

Purpose of this paper

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

    1.1 the issues we have identified within this topic area;

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

    1.3 the reasons for our proposed responses;

    1.4 the steps we have taken to ensure that all the parameters remain fit for purpose, given changes in the overall environment faced by suppliers since the IMs were originally set; and

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

Where this paper fits into our package of papers on our draft decisions

2. This topic paper forms part of our package of draft decision papers on the IM review. For an overview of the package of papers and an explanation of how they fit together, see the Introduction and process paper published as part of our draft decision package.[1]

3. This paper explains our proposed responses to the issues identified within the cost of capital topic.

4. To the extent our preferred approaches involve changes to the IMs, this paper explains how we propose to change our existing IM decisions to account for issues within this topic area. The report on the IM review then collates our proposed changes to those existing IM decisions.[2]

5. Our proposed drafting changes to the IMs, including any resulting from this topic area, are shown in the draft determinations, which will be published on 22 June 2016.

[1] Commerce Commission "Input methodologies review draft decisions: Introduction and process paper" (16 June 2016).

[2] We expect to publish the Report on the IM review on 22 June 2016.

6. The framework we have applied in reaching our draft decisions on the IM review is set out in a separate paper, published alongside this paper.[3] The framework paper explains that we have only proposed changes to the current IMs where this appears likely to:

   6.1 promote the Part 4 purpose in s 52A more effectively;

   6.2 promote the IM purpose in s 52R more effectively (without detrimentally affecting the promotion of the s 52A purpose); or

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

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

Structure of this paper

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

   8.1 description of the issue and how it was identified;

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

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

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

9. 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 views.

Introduction to this topic

10. 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, can be found in Chapter 2.

11. We identified a number of issues through consultation on our problem definition paper,[4] cost of capital update paper,[5] and the High Court's comments in the 2010 IM

[3] Commerce Commission "Input methodologies review draft decisions: Framework for the IM review" (16 June 2016).

[4] Commerce Commission "Input methodologies review invitation to contribute to problem definition" (16 June 2015).

judgment.[6] We have sought to address these issues and detail our proposed approaches at the beginning of each chapter.

12. Dr Lally has provided us with advice on a number of cost of capital issues including the cost of debt, asset beta adjustments, the TAMRP, Regulated Asset Base (**RAB**) indexation and inflation risk. We published his two reports, one in February,[7] and one in May,[8] and have considered his advice and the submissions we received on that advice, when forming our draft decisions.

13. As we indicated in our problem definition 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. The availability of more recent data has also helped to provide a better estimate for these parameters.[9] The discussion of these parameters and our reasoning for any amendments to them follow the discussion of the identified issues in each chapter.

Who does this paper apply to?

14. This paper applies to:

    14.1 Electricity Distribution Businesses (**EDB**s);

    14.2 Gas Transmission Businesses (**GTB**s);

    14.3 Gas Distribution Businesses (**GDB**s);

    14.4 Transpower; and

    14.5 regulated airports.

Invitation to make submissions

15. We invite submissions on this paper by **5pm on 28 July 2016**. We then invite cross submissions by **5pm on 11 August 2016**.

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5 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015).

6 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289.

7 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016).

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

9 Commerce Commission "Input methodologies review invitation to contribute to problem definition" (16 June 2015), p.60.

16. Please address submissions and cross submissions to:

    Keston Ruxton
    Manager, Input Methodologies Review
    Regulation Branch
    im.review@comcom.govt.nz

17. Please clearly indicate within your submission which aspects of this paper it relates to.

18. The Introduction and process paper contains further details about the submissions process. This includes:[10]

    18.1 explaining that material provided outside of the indicated timeframes without an extension might not be considered in reaching our final decisions;

    18.2 providing guidance on requesting an extension to the submissions timeframes;

    18.3 noting that we prefer submissions on our draft decisions in a file format suitable for word processing, rather than the PDF file format; and

    18.4 providing guidance on making confidential submissions.

[10] Commerce Commission "Input methodologies review draft decisions: Introduction and process paper" (16 June 2016), chapter 5.

Chapter 2: Context

Purpose of this chapter

19. The purpose of this chapter is to provide an introduction to:

    19.1 the WACC;

    19.2 our current IM for estimating the cost of capital and its key parameters;

    19.3 the role of the cost of capital IM in Part 4 regulation; and

    19.4 our review of the cost of capital IM, including our review of the issues identified by the High Court and the changes we propose to make.

What is the weighted average cost of capital?

20. 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. The cost of capital is an estimate of that expected rate of return.

21. The WACC reflects the cost of debt and the cost of equity, given the mix of debt and equity. There is a post-tax WACC and a vanilla WACC. The former includes the after-tax cost of debt; the latter includes the cost of debt before tax, as shown in the following equations.

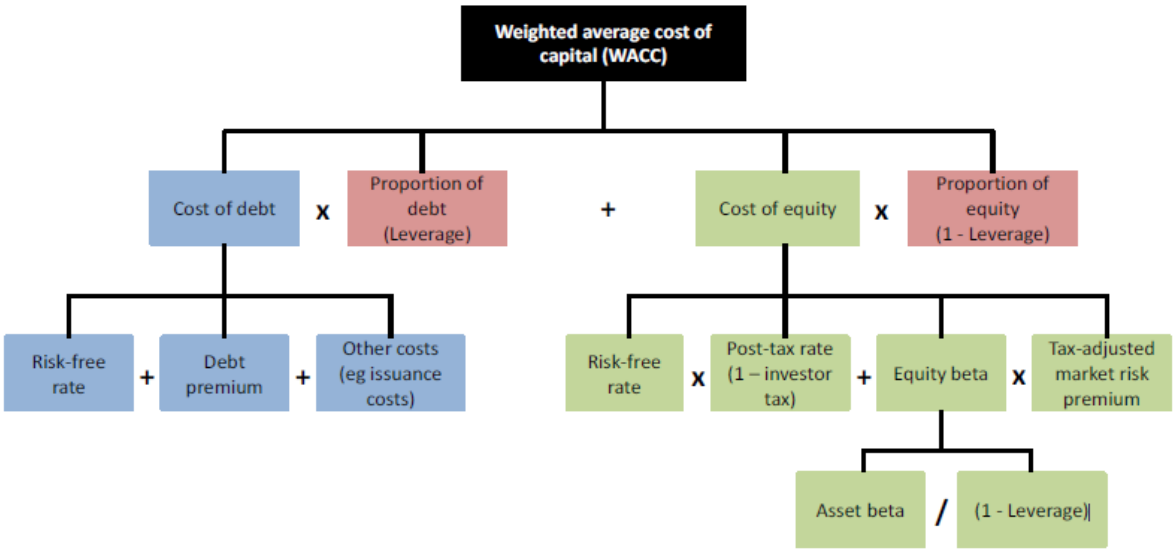
    Post-tax WACC = cost of debt (after tax) x leverage + cost of equity x (1 - leverage)

    Vanilla WACC = cost of debt x leverage + cost of equity x (1 – leverage)

22. Post-tax WACC estimates are more frequently used in New Zealand, and more easily understood by interested persons, than vanilla WACC estimates. However, the use of vanilla WACC estimates is consistent with the IM's approach to regulatory tax for default price-quality paths (**DPP**s) and customised price-quality paths (**CPP**s). Accordingly, vanilla WACC estimates are currently used for DPPs, CPPs, and individual price-quality paths (**IPP**s), while both vanilla WACCs and post-tax WACCs are estimated for the purposes of information disclosure (**ID**) regulation.

23. To derive our estimates, a number of parameters, as set out in Figure 1 must be calculated.

Figure 1: WACC and its parameters



24. 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.

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

26. WACC is estimated because it cannot be observed directly. The relevant estimate is the market's view of the cost of capital for providing the service, not the cost of capital specific to one supplier, or a supplier's view of its cost of capital for that service.

27. If suppliers of a regulated service have similar exposure to systematic risk—that is, if they have similar technology, scale, cost structures, exposure to macroeconomic factors and exposure to regulation—then we should, in principle, apply a 'benchmark' or service-specific cost of capital for all suppliers of the regulated service. On the other hand, if suppliers have a materially different exposure to systematic risk then we should, in principle, apply a supplier-specific cost of capital for each supplier of the regulated service.

28. In 2010 we identified the parameters in the cost of capital estimation that could be considered on a supplier-specific basis as leverage, debt premium, and the equity (or asset) beta. In making our decisions for electricity distribution services and gas pipeline services, we considered each of these parameters individually and concluded that service-specific estimates would be more appropriate for each of

them. We continue to consider that service-specific estimates are more appropriate for these parameters.

What is the cost of capital input methodology?

29. Our cost of capital IM comprises two parts:

    29.1 The first and most significant component is a methodology for calculating WACC. The WACC is determined for each regulated service and applies to all regulated suppliers of that service.

    29.2 The second component is the TCSD (explained in paragraph 56), which is treated as a separate component because it will apply to qualifying firms only.

30. The cost of capital IM is used to produce estimates of the cost of capital for regulated services on a forward-looking basis. That is, it reflects expectations of the returns required in the future, which cannot be observed in advance. The estimate of the cost of capital is used to assess the profitability of regulated suppliers (in ID regulation) and as an input in setting price-quality paths.

How is the WACC component of the cost of capital IM estimated?

31. The estimation of the cost of capital is not a mechanical task. The available tools used to estimate the cost of capital are imperfect; the data can be hard to obtain or unreliable and can change over time; older data can be reinterpreted in new ways and newer data may call into question previous assumptions.

32. To determine the methodology for estimating the cost of capital, and to assure ourselves that the estimate is reasonable and meets the Part 4 purpose and the purpose statements for ID regulation and price-quality regulation, we therefore have to exercise a degree of judgement.

33. In estimating the current WACC methodology, we carefully considered the effect of a number of choices individually and in combination to estimate the cost of capital based on current market conditions. We then tested the resulting estimate of the cost of capital against a range of market information to ensure the IM is reasonable and commercially realistic, in the context of how the cost of capital is to be applied in regulation under Part 4.

34. The cost of capital IM does not specify the cost of capital for a regulated service directly. Rather, it sets out the methodology for determining the cost of capital for each service. Some parts of the IM specify values for certain parameters, such as tax rates, while other parts specify a methodology for obtaining estimates where information is constantly changing, such as interest rates. We explain in more detail how the current cost of capital IM estimates these parameters below.

35. In addition to estimating all of the relevant parameters, we must assess the risk associated with setting the WACC too high or too low. We consider that the costs of

our WACC estimate being wrong are asymmetric, and as a result, we increase the WACC used for price-quality regulation by using a percentile higher than the mid-point estimate.[11]

36. The final part of our review is to conduct reasonableness checks to test whether our proposed application of the IM 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 2010 IMs reasons paper,[12] and the 2014 WACC percentile reasons paper.[13]

Cost of debt

37. Debt is an important source of capital for many businesses. We estimate the cost of debt by observing 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). We also allow for the costs of issuing debt (for example, to cover roadshows and brokerage), and the cost of entering interest rate swaps to shorten the term of part of the cost of debt and match it to the length of the regulatory period.

38. Our estimate of the cost of debt comprises four parameters:

    38.1 the risk-free rate;

    38.2 the debt premium;

    38.3 debt issuance costs; and

    38.4 an allowance for swap costs.

39. The risk-free rate is the rate of interest expected when there is no risk of default. Debt issued by the New Zealand Government and denominated in New Zealand dollars is considered to be free of default risk. The rate of interest on government issued debt can generally be readily observed from the trading on the debt market.

40. The debt premium is the additional interest rate, over and above the risk-free rate, required by suppliers of debt capital to compensate them for being exposed to the risks of default in lending to a firm, plus an allowance for the inferior liquidity of

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11 Commerce Commission "Input methodologies review draft decisions: Topic paper 6 – WACC percentile for airports" (16 June 2016) explains our draft decision to publish a midpoint WACC and standard errors for airports information disclosure regulation, rather than the 25th to 75th percentiles.

12 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010).

13 Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services – Reasons paper" (30 October 2014).

corporate bonds relative to government bonds. In general, the longer the firm wishes to borrow the debt for, the higher the debt premium that the firm has to pay to the suppliers of debt capital.

41. Firms incur costs when raising new 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. We consider these costs should be included in the cost of capital for regulated suppliers.

42. Firms have a mix of debt maturities to manage refinancing risk, including issuing long-term debt. This spreads a firm's refinancing requirements over a longer period and reduces the amount of debt that needs to be refinanced in any one year. Reducing refinancing risks has benefits for consumers, but long-term debt typically has a greater cost than medium or short-term debt.

43. Firms can efficiently manage interest rate risk by entering an interest rate swap that enables the supplier, if it wished, to cover the cost of aligning the interest rate setting to the price setting. Accordingly, we have included an allowance for the costs of entering interest rate swaps.

Cost of equity

44. The cost of equity, expressed as a rate of return, is the discount rate implicit in the price at that equity can be raised (given the investors' expectations of future cash flows which they will derive or have claim to). This discount rate cannot be directly observed or calculated because the investors' true expectations cannot be directly observed.

45. The difficulties in estimating the cost of equity are greater than in estimating the cost of debt. The cost of equity, and most of its components, is difficult for us to directly observe, so they have to be estimated based on an analytical model. Then the inputs for the preferred model have to be estimated.

46. The cost of equity is higher than the cost of debt as equity holders take on more risk than debt holders (taking account of the different taxation treatments that may apply). There is a significant variation in risk between firms in different sectors of the economy.

47. There are a number of methods to estimate the cost of equity including the Capital Asset Pricing Model (**CAPM**), the dividend growth model and the Fama-French three factor model. Of these, the CAPM is the most commonly used.

48. The CAPM proposes that the cost of equity can be modelled as comprising a risk-free component and a premium for risk. Under the CAPM, the size of the premium for risk increases in line with increases in the firm's exposure to systematic risk (with a measure of this risk, which is referred to as beta). Systematic risk refers to market-wide risks which affect all risky investments. Non-systematic risk refers to risks which affect an individual company.

49. The Brennan-Lally CAPM (Dr Lally's adaptation for New Zealand circumstances of a CAPM model elaborated by Brennan) was developed to reflect New Zealand's taxation system. Specifically, it recognises the presence of imputation credits and the general absence of taxes on capital gains. There is an extended form of the Brennan-Lally CAPM and a simplified version, but it is the simplified Brennan-Lally CAPM (**SBL-CAPM**) that has become the dominant form of the CAPM used in New Zealand. Indeed, in New Zealand the term SBL-CAPM has become largely synonymous with the generic term CAPM, and the terms are frequently used interchangeably.

50. The market risk premium (**MRP**) represents the additional return, over and above the risk-free rate, that investors look for to compensate them for the risk of holding a portfolio of average risk (more precisely the market portfolio which is the average risk portfolio).

51. Under the SBL-CAPM, the MRP is adjusted for tax faced by the investor on equity returns; therefore the MRP becomes the tax adjusted MRP (**TAMRP**).

52. Beta is a measure of exposure to systematic risk. Systematic risk measures the extent to which the returns on a company fluctuate relative to the equity returns in the stock market as a whole. If an investment had no systematic risk (ie, it would show no correlation with returns on the market), its equity beta would be zero. If an investment in the equity of a company is of average risk, the equity beta will be 1. This means that the premium over the risk-free rate that equity investors expect will be the same as the average for the overall market (the TAMRP).

53. Beta is estimated empirically. As the cost of capital is intended to be forward-looking, forward-looking betas are required. As there is no reliable way to forecast asset betas, we assume that historic beta estimates are indicative of future betas. Historic estimates of average betas are used as beta is expected to be relatively stable over time.

54. Tax situations specific to particular investors do not, in principle, affect the cost of capital. Taxes are borne by the individuals themselves, not by the firms of which they are shareholders. Therefore, the cost of capital IM does not provide for the tax circumstances of individual investors (accumulated tax losses, inability to use imputation credits). We mirror the statutory tax rate for corporate tax and the maximum prescribed investor rate under the Portfolio Investment Entities (**PIE**) regime for investor tax.

55. Leverage refers to the mix of debt and equity capital that is used to fund an investment. Leverage is used in two places in estimating the cost of capital. One use is to re-lever the asset beta into an equity beta (and vice versa). The second use is to derive a WACC from the estimates of the cost of debt and the cost of equity.

How is the term spread credit differential component of the cost of capital IM estimated?

56. The cost of capital IM allows companies a TCSD allowance to compensate for the additional debt premium and the interest rate swap execution costs that can be incurred from issuing debt with a longer term than the five-year regulatory period.

57. 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 issued long-term debt to prudently manage their refinancing risks.

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

    58.1 the additional debt premium associated with each issuance of debt that has an original term to maturity in excess of over the five-year debt premium (the 'spread premium');[14]

    58.2 an allowance for swap costs;[15] and

    58.3 a negative adjustment to take account of the lower per annum debt issuance costs that are associated with longer-term debt.[16]

The role of the cost of capital IM in Part 4 regulation

59. Section 52T(1)(a)(i) requires the IMs relating to particular goods or services to include, to the extent applicable under the relevant type of regulation, an IM for the cost of capital. The cost of capital is the financial return investors require from an investment given its risk.

60. The cost of capital IM plays a significant role in promoting the s 52A purpose.[17] Because the actual cost of capital of regulated suppliers is not observable, we must make an estimate. The cost of capital IM seeks to estimate a cost of capital that is reasonable and commercially realistic given investors' exposure to risk. This ensures expectations are for a real rate of return consistent with our principle of financial capital maintenance (**FCM**) and s 52A.[18]

61. Due to the estimation difficulties described at paragraph 31, determining a cost of capital IM that estimates a cost of capital which is neither too high, nor too low, so that the objectives in s 52A(1)(a) to (d) are balanced appropriately, is a difficult task and one that involves significant amounts of judgement.

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14 This debt is called 'qualifying' debt.

15 As discussed in Chapter 3, we propose to remove the allowance for swap costs from the TCSD.

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

17 For a more detailed discussion of the s 52A purpose see: Commerce Commission "Input methodologies review draft decisions: Framework for the IM review" (16 June 2016).

18 The FCM principle is discussed in the framework paper referred to in the footnote above. It is often referred to in this paper, and in Dr Lally's advice, as the 'NPV=0' principle.

62. We consider that where improvements to data or economic or regulatory practice have occurred, with the consequence that we are now better able to accurately estimate the cost of capital, making those changes will better promote the s 52A purpose.

Our review of the cost of capital IM

63. As part of the IM review process, through our problem definition paper and cost of capital update paper, and through comments from the High Court, 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 since the IMs were originally set.

64. The High Court considered that the following aspects of the cost of capital IMs should be part of any future IM review:

    64.1 the appropriateness of using the 75th percentile of the WACC in price-quality regulation;[19]

    64.2 the suitability of using the SBL-CAPM to estimate the cost of capital given the 'leverage anomaly', and whether alternative approaches could be considered;[20]

    64.3 whether a TCSD is required;[21] and

    64.4 to consider MEUG's suggestion of a split cost of capital approach whereby a higher WACC is applied to new investment.[22]

65. We considered the High Court's scepticism about the rationale for 75th percentile to be the most significant comment. We considered that the judgment led to uncertainty over the future WACC percentile to be used in setting price-quality paths. In our view, the uncertainty it created undermined the rationale for using a percentile higher than the mid-point, although prices were set to reflect use of the 75th percentile.

66. Given this uncertainty, we examined this particular matter urgently under s 52X, rather than waiting for the current s 52Y review. The completion of that review for gas and electricity businesses in October 2014 (the WACC percentile amendment) resulted in a reduction in the percentile used for price-quality regulation in these two

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19 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1486].
20 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1594-1661].
21 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1288].
22 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1486].

sectors from the 75th to 67th percentile.[23] The rationale for the amendment and the reasons for the change can be found in the final reasons paper for that amendment.[24] We have seen no evidence since the completion of the percentile amendment that indicates that we should change the percentile used.

67. We also identified an issue regarding the divergence between the revised CPP and the existing DPP WACC, which potentially affected the incentives to apply for a CPP. Our proposed approach, which is discussed in Chapter 4, is to remove the requirement to determine a CPP-specific WACC.

68. We have updated the asset betas for EDBs, GPBs, Transpower and regulated airports by following largely the same approach as in 2010. We have identified new comparator samples, estimated equity betas for each sample and then de-levered the equity betas using the average leverage of the proposed new samples. As discussed in Chapter 4, we propose to adopt an unadjusted asset beta of 0.34 for EDBs and GPBs and an adjusted asset beta of 0.58 for airports.

69. We have also reconsidered whether to continue with adjustments to the asset betas to reflect differences in regulatory regimes and systematic risks. As discussed in Chapter 4, we have proposed to make no adjustment for regulatory differences for EDBs, GPBs, Transpower and airports. However, due to new evidence provided by Dr Lally, we are proposing to remove the 0.1 upwards adjustment to the GPB asset beta that we previously made for differences in systematic risk. As discussed in Topic paper 1,[25] we are seeking views on the whether we should allow GPBs the option of shortening asset lives to mitigate stranding risk.

70. We have proposed to largely maintain the current debt premium methodology. However, we propose to extend the determination window for both the risk-free rate and debt premium from one month to three months. We have also proposed to remove restrictions on the use of bonds from firms that are majority owned by the government or local authorities, and have regard to the debt premium estimated from fitting a NSS curve to the bond data.

71. We have reviewed the efficacy of the TCSD as suggested to us by the High Court, and sought to address a number of implementation issues with our approach by proposing two modifications, which are discussed in Chapter 3.

72. MEUG suggested that we should use Black's simple discounting rule (**BSDR**) as an alternative method to estimate a benchmark return, or as a sense check. We

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23 We reached our decision on the WACC percentile amendment for price-quality regulation in October 2014. Our decision in respect of information disclosure for electricity and gas businesses followed in November 2014.

24 Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services – Reasons paper" (30 October 2014).

25 Commerce Commission "Input methodologies review draft decisions: Topic paper 1 – Form of control and RAB indexation for EDBs, GPBs and Transpower" (16 June 2016).

consider that the BSDR is an intuitively appealing method from which to assess the appropriate rate of return for a regulated business. However there are a number of challenges that would need to be overcome before we could use it to provide material benefit in our regulatory regime. As a result, we do not propose to use BSDR as a cross-check on the WACC until some of the identified issues have been resolved.

73. Having conducted our review, we propose to make the following changes to the cost of debt:

    73.1 continue to use the prevailing risk-free rate, but use three months of data instead of one month;

    73.2 modify the debt premium methodology implementation by:

        73.2.1 using three months of data instead of one month;

        73.2.2 removing the government ownership limitation on comparator bonds; and

        73.2.3 have regard to the NSS curve as something we will consider when estimating the debt premium.

    73.3 change issuance costs from 35 basis points (0.35%) p.a. to 20 basis points (0.20%) p.a.; and

    73.4 remove an allowance for swap costs from the TCSD and include it as part of the debt issuance costs.

74. We propose to make the following changes to the cost of equity:

    74.1 change the asset beta estimate for GPBs – from 0.44 to 0.34 (because we propose to change the asset beta adjustment for GPBs – from 0.1 to 0);

    74.2 change the leverage estimate for EDBs and GPBs – from 44% to 41%; and

    74.3 change the leverage estimate for airports – from 17% to 19%.

75. We also propose to make the following implementation change to the TCSD:

    75.1 use a fixed linear relationship to determine the additional debt premium associated with debt issued with an original maturity term of more than five years for electricity and gas companies;

    75.2 no longer include an allowance for swap costs as part of the TCSD; and

75.3 remove the TCSD for airports.[26]

76. We no longer propose to publish a 25th and 75th WACC percentile estimate for airports. The proposed change is to calculate additional mid-point WACC estimates, along with standard errors for the quarters that do not align with WACC estimates currently calculated for ID, and publish these additional estimates either when requested by an airport, or prior to an airport's price setting event. This issue is discussed in Topic paper 6.[27]

77. Most of our changes our proposed because we consider that they enable us to more accurately estimate a cost of capital that is reasonable and commercially realistic while maintaining consistency with s 52R and not increasing complexity or compliance costs. As discussed, our view is that a more accurate cost of capital better promotes the s 52A purpose.

78. We have also proposed a number of our draft decisions because we consider that they reduce complexity (eg, the simplification of the TCSD implementation), reduce compliance costs (eg, amendments to the debt premium methodology) or enhance the certainty of an IM (eg, asset beta and leverage) without negatively affecting the promotion of the s 52A purpose.

[26] The TCSD applied to airports is not defined in the input methodologies. Instead it is defined in the information disclosure determination. The proposed changes to the information disclosure determination published alongside the IM review draft decision are only ex ante amendments, ex post will be considered as part of a separate process.

[27] Commerce Commission "Input methodologies review draft decisions: Topic paper 6 – WACC percentile for airports" (16 June 2016).

Chapter 3: Cost of debt

Purpose of this chapter

79. The purpose of this chapter is to explain our draft findings on:

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

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

Structure of this chapter

80. This chapter begins with a summary of our key proposals in respect of the cost of debt.

81. This chapter then discusses the main issues raised in relation to the cost of debt, and explains our proposed responses to them.

82. We then explain our draft findings in respect of our review of each of the parameters that make up the cost of debt, including any changes we propose to make as a result.

83. Each section of this chapter begins with the issues for EDBs and GPBs and then details any differences for airports.

Summary of proposals in respect of the cost of debt

84. In general, we do not consider that there are significant issues with our current methodology for estimating the cost of debt. Although a number of submissions focussed on cost of debt issues, the changes that we propose are generally minor. They are intended to be relatively small incremental improvements to our current methodology.

85. A key focus from submissions was a suggestion that our current methodology to estimate the risk-free rate and debt premium, which uses 'prevailing' or 'current' information, causes unnecessary cost and risk to consumers and suppliers.[28] A number of suppliers supported a trailing average approach,[29] which we had identified as a potential alternative in our WACC update paper.[30]

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28 Transpower's submission "Update paper on the cost of capital" (5 February 2016), p1.

29 For example: PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 16; Aurora "Input methodologies review: Update paper on the cost of capital topic" (5 February 2016), p.1; ENA "Submission on IM review: Cost of capital" (9 February 2016), para 18.

30 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015).

86. After considering advice on this topic from Dr Lally together with all of the submissions, we are not convinced that the advantages of moving to a trailing average approach outweigh its disadvantages and the costs of a significant change to our cost of debt methodology.[31] We maintain our view from 2010 that the prevailing rate provides better investment incentives, and any disadvantages from using prevailing rates are not sufficient to justify a significant change in approach.[32]

87. However, we propose to make some more minor modifications to our cost of debt methodology that are intended to mitigate some of the issues raised with the current approach. This includes some changes to the TCSD and a reassessment of the appropriate debt issuance costs. A summary of our proposed changes to the IMs related to the cost of debt are to:

    87.1 keep the current prevailing approach for the risk-free rate and debt premium but expand the averaging period used from one month to three months;

    87.2 keep the current debt premium methodology but have regard to a secondary methodology, which determines a NSS curve based on the available bond data;[33]

    87.3 adapt the calculation of the TCSD so that it provides a more consistent allowance for bonds with a maturity date longer than five years; and

    87.4 set the debt issuance costs to be 0.20% per annum.

Identified focus areas

88. In reviewing the IMs, we focussed on the specific areas related to the estimate of the cost of debt that were raised internally and by external stakeholders. This process included the publication of a problem definition paper (which covered issues that had been raised by the High Court),[34] and a WACC update paper published in November 2015.[35]

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

32 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H4.13.

33 Apart from a modification to the use of government-owned bonds.

34 In its judgement on the appeals to the setting of the original IMS, the High commented on certain aspects of the cost of capital IMs. See: *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289.

35 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015).

89. Following submissions on these papers and internal assessment, we identified four specific areas related to the cost of debt methodology for further consideration. These areas are:

89.1 whether setting the benchmark cost of debt using our current 'prevailing' methodology is appropriate including our consideration of an alternative 'trailing average' approach;

89.2 whether the cost of debt should be updated annually during a price-quality path;

89.3 whether we can improve the accuracy or predictability of the existing methodology used to estimate the cost of debt; and

89.4 whether the TCSD is necessary, or whether the current methodology can be improved.

Issues raised with our prevailing approach to estimating the cost of debt

90. Our current approach to estimating the cost of debt averages the risk-free rate and debt premium over one calendar month. This month is immediately prior to the month for which the WACC is being estimated.[36] This approach is described as using the 'prevailing rate' because it is the rate prevailing relatively close to the start of the price path.[37]

91. When determining a WACC for price-quality paths we apply the prevailing approach to one calendar month of data, seven months prior to the start of the path.[38]

92. We decided to use prevailing (or current) interest rates when setting the original IMs because we considered that they better achieved the Part 4 purpose and the potential dynamic efficiency benefits of investment, than the use of historic rates.[39]

Issues raised with the current approach

93. We received a number of submissions from suppliers that felt that the use of a prevailing approach resulted in increased costs or risks for companies. They suggested that it is difficult, as a regulated supplier, to exactly match the actual

[36] For price-quality paths prevailing rates are calculated by averaging the data over one calendar month prior to when the cost of capital is being estimated. For more details on how these prevailing rates are calculated. See: Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H.4.1.

[37] Alternative names for the prevailing approach are the 'on the day' approach or 'current interest rates' approach.

[38] For example, for the default price-quality paths and individual price-quality paths starting on 1 April 2015, this month was August 2014. See: Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H.14.5.

[39] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H4.10-H4.13.

financing prices with the benchmark cost of debt estimate used in the WACC calculation.

94. Suppliers suggested that a trailing average would provide more stability and be more consistent with the debt-financing actions taken by an efficient regulated supplier. For example, PwC, Orion and Transpower submitted that:

> We submit that a trailing average of at least 5 years of bond yield data should be used to estimate both the risk-free rate and debt premium. This approach would reduce the volatility between estimates over time, and remove the emphasis on a single month every five years. Importantly it would better reflect the efficient financing arrangements of EDBs, who issue debt on a rolling basis over the course of a regulatory period. It would also be consistent with recent regulatory precedent in Australia and the UK, where a number of regulators have now adopted trailing averages.[40]
>
> We support using trailing averages, in order to reduce volatility and increase certainty. This would also better reflect efficient financing approaches.[41]
>
> In our view the rate on the day approach results in excessive and unnecessary volatility that is highly unlikely to occur in a workably competitive market (and would not occur under a trailing average approach).[42]

95. We received a number of detailed submissions on this topic. The issues raised in submissions that are related to the use of a prevailing approach can be summarised as:

    95.1 *Refinancing risk:* a prevailing approach results in a large refinancing risk to suppliers because it implicitly assumes all suppliers refinance their debt in a one month window immediately prior to a price-quality path.[43]

    95.2 *Mismatches in the debt premium:* there is no ability to hedge the pricing risk associated with the debt premium for debt issued outside the determination window.[44]

    95.3 *Swap market costs:* a prevailing approach results in unnecessary swap market costs/risks on businesses that try to replicate the regulatory approach.[45]

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40 PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 16.

41 Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 5.

42 Transpower's submission "Update paper on the cost of capital" (5 February 2016), p.7.

43 Transpower's attachment to their submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.7; PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 77.

44 PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 80; Transpower's submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.8.

95.4 *Period-to-period volatility:* There is the potential for significant volatility in the WACC from one regulatory period to another that feeds through to regulated prices.[46]

96. We consider each of these separate issues in the following section.

Refinancing risk

97. In general, we do not consider that there are significantly higher refinancing risks under a prevailing approach.[47] Submissions did not appear to disagree with our suggestion that suppliers have the ability to (and do) issue debt on a rolling basis and use interest rate swaps to hedge against interest price movements.[48]

98. The ability to use the swap market means that suppliers who issue their debt on a rolling basis (to minimise refinancing risk) are able to reduce the impact from mismatches between the interest rate of the debt that they issue and the allowance provide by the WACC.[49]

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[45] Firms may replicate the regulatory approach in order to limit the exposure to differences between the compensation they receive for their cost of capital and their real costs. See: Powerco "Submission on Input methodologies review: Invitation to contribute to problem definition" 21 August 2015, para 58.6; Transpower's submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.5.

[46] PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 75-76; Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 5.

[47] We consider that 'refinancing risk' is the risk that suppliers are unable to access debt funding (or access come at a significant cost) at the time they need to refinance or issue debt. One example might be because of a significant economic shock that significantly reduces the willingness of companies to buy debt. We consider this is separate to the exposure of companies to the interest rate paid on debt that they issue. We consider that this 'interest pricing risk' can be treated separately to 'refinancing risk' because the interest rate paid by suppliers, can be hedged, to a certain extent, through the use of interest rate swap contracts. As we discuss later in this document, we recognise there are practical difficulties in hedging the debt premium element.

[48] Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), para 2.31.

[49] The use of interest rate swaps allows firms to choose the interest rate re-pricing period it faces, independently of the maturity date of the debt. When referring to swaps in this chapter, we are generally referring to NZD vanilla interest swaps.

99. Some submissions suggest that our approach implies that suppliers will refinance all debt in the narrow determination window that is used to set the WACC. For example Transpower suggested:[50]

> The rate-on-the-day approach assumes implicitly that suppliers will refinance their entire debt portfolios at once (or within a very short timeframe) at the beginning of every regulatory period. A supplier that strives to match its actual cost of debt to the regulatory allowance under the rate-on-the-day approach would have to refinance its debt portfolio in this way. This would leave the supplier with all of its debt maturing, and having to be refinanced, at the end of the regulatory period. This means that the entire debt portfolio will be subject to refinancing risk at the same time.

100. We do not consider that use of a prevailing methodology necessarily implies that suppliers would behave in this way. The prevailing rate provides a benchmark cost of debt, including an allowance for any additional costs for suppliers that issue debt with original tenors longer than the original five-year regulatory period.

101. Suppliers themselves determine their debt management strategy, including how much debt they issue (if any) during the determination window. Evidence from the confidential debt survey appears to confirm that they do not only issue debt in the period over the determination window, but instead they issue debt on a regular basis and use interest rate swaps to help manage interest rate pricing risks. As described by Houston Kemp (for Powerco):[51]

> An interest rate swap is an instrument that allows a business to convert its exposure to floating rate interest payments into fixed rate payments, or vice versa. A supplier that issues fixed rate debt, but seeks to fix its base rate exposure over the regulatory control period, will enter into two sets of interest rate swaps and will therefore incur the costs of swaps twice:
>
> - it will swap fixed rate debt into floating rate debt at or near issuance, ensuring that all debt is subject to floating rate exposure prior to the start of the regulatory control period; and
>
> - it will swap this floating rate exposure back into a fixed rate exposure, fixed for five years, over a period consistent with when the Commission measures the risk free rate.
>
> Entering into these arrangements will not allow a supplier to match the cost of debt allowance under the IMs. As noted above, this is not possible unless the supplier engages in lumpy debt issuance. However, interest rate swaps can allow a supplier to approximately match the risk free rate component of the cost of debt, leaving it exposed only to movements in the debt premium.

102. As a result, 'refinancing risk' appears to be less relevant than some more specific risks and costs affecting suppliers. These are the practical costs associated with

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50 Transpower's attachment to their submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.7.

51 Houston Kemp "Comment on the Commerce Commission's cost of capital update paper" (report prepared for Powerco, 5 February 2016), p.13.

hedging the risk-free rate using the swap market (swap market costs), and the exposure of companies to pricing risk associated with the debt premium.

Mismatches in the debt premium

103. An important issue to consider when applying a prevailing approach methodology is the potential mismatch between the debt premium incurred by firms who issue debt on a regular rolling basis, and that allowed for in the WACC. Firms can be exposed to any difference between the debt premium paid at the time they issue debt and the debt premium determined during the averaging window prior to the setting of the WACC.[52]

104. This mismatch arises because there is no practical way to hedge the debt premium in New Zealand (ie, there is no significant credit default swap market). Therefore, unless all debt is refinanced during the determination window, the debt premium allowed for by the Commission would not be perfectly matched by the supplier.

105. Transpower has argued that these mismatches are significant and currently cost it ca. $15m p.a. because its average debt premium incurred was ca. 40-50 bps higher than that allowed for in the determination window.[53]

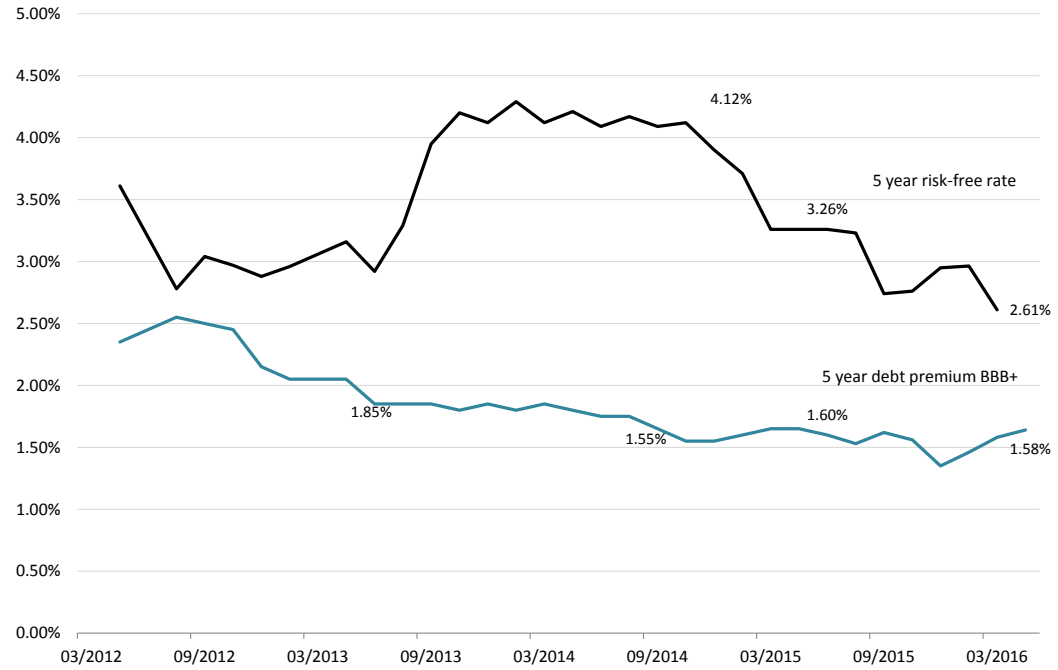
106. We do not consider the impact has been as significant as suggested by Transpower. Figure 2 shows the debt premium as determined by the Commission has been relatively stable (particularly compared to the risk-free rate) with an average over the last five years of ~1.85%.

107. The debt premium allowed for in the August 2014 determination window was 1.65%. This suggests that the identified mismatch in this determination would be of the order of 20 bps, or roughly half of that suggested by Transpower.

[52] Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.9-10.

[53] Transpower's attachment to their submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.5.

Figure 2: Commission estimates of the risk-free rate and debt premium (BBB+)



108. Despite this, potential mismatches of the debt premium are a known disadvantage of the prevailing approach. However, we consider the effect is mitigated by a number of factors:

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

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

108.3 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 MRP and its true value.[54]

109. Given these mitigating factors, we do not consider the potential for mismatches between the debt premium incurred by suppliers and that provided for in the WACC to be significant enough to warrant a change in the approach to estimating the cost of debt. As outlined in paragraphs 128 to 140, we consider any advantage provided by an alternative trailing average approach in minimising the potential for

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

mismatches in the debt premium, does not outweigh disadvantages from applying such a change.[55]

Swap market costs

110. Suppliers raised concerns there are costs associated with using the interest rate swap market. In particular, they suggest that the swap market is subject to distortions if suppliers attempt to procure large numbers of swaps at the same time. The one month period used to determine the WACC will encourage suppliers to enter into swap contracts over this time.

111. For example, Transpower noted that:[56]

> By comparison to the size of the interest rate swap market in New Zealand, which is estimated by Westpac to be ca. $150 million per day for five year tenor based upon observed average volumes, the volume to be reset during the determination window significantly exceeds average daily market volumes. Further, in order to match the regulatory allowance and minimise refinancing risk requires the volume to be moved evenly and consistently over each of the determination window days. This presents a significant economic equilibrium problem where supply exceeding demand and consequently price will invariably move upwards.

112. Other particular issues raised by suppliers are the uncompensated costs associated with hedging differences between the swap rate and risk-free rate;[57] and the need to use forward starting swaps, given that the market yields on which a WACC is determined are ~7 months prior to the start of a price path.[58]

113. Transpower suggested there could be an impact of 50 bps on the swap market from the concentrated demand from regulated suppliers over a one month period. However, there is no empirical evidence given on this point.[59] Any increase in price will depend on both the demand from regulated businesses and the supply of swaps being offered by financial providers.

114. We have been provided with limited evidence that suggests the swap market is not competitive (ie, that the provision of swaps will not increase to cope with additional demand), however, we consider that it is possible that the one month window may have some distortionary effects in the way suggested by submitters.

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55 It is also not clear that applying a trailing average would eliminate these mismatches as it would require a supplier to fully replicate a debt strategy consistent with the approach assumed by the regulator.

56 Transpower's attachment to its submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.22.

57 Transpower's submission "Update paper on the cost of capital" (5 February 2016), p.5.

58 Assuming a rising interest rate curve vs tenor.

59 Transpower's attachment to their submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.22.

115. We, therefore, propose to increase the determination window from the current one month window to three months. This extension of the window will help to reduce the potential for market distortion. This extension of the averaging period is supported by Dr Lally for the same reasons.[60]

116. In general, we do not consider specific details of swap market behaviour and transaction costs by suppliers. Firms are likely to behave differently, depending on their financial strategy, and the precise magnitude of any additional costs is uncertain and is likely to vary based on debt market conditions.

117. As a result we do not analyse all of the potential costs that could be associated with the operation of firms in the swap market. Instead, for simplicity, we provide a benchmark cost of debt and include an allowance for debt issuance costs. We consider this allowance is sufficient, at a general level, to compensate suppliers for the costs of both debt issuance and the costs of undertaking swap transactions. Further details on how this allowance is determined are provided in paragraphs 218 to 246.

118. One cost that some submissions focussed on is an additional cost due to the difference between the government bond rate and the swap rate.[61] However, as noted by Dr Lally, evidence he has previously provided on this topic suggests that any impact is likely to be minimal.[62] This approach would also require a review of our TAMRP as it is currently determined as a premium to the government bond rate.

Period-to-period volatility

119. The final issue raised with the prevailing approach is the claim that it results in volatile estimates of the WACC that can change significantly from one period to another. This point was raised by a number of suppliers who suggested the volatility affected both their own costs and also has a detrimental impact on consumers, who may be subject to significant price changes.[63]

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60 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.17.

61 Frontier Economics' submission on the problem definition paper "Recommendations on priorities for review of cost of capital input methodology" (report prepared for Transpower, 21 August 2015), p.6.

62 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.8.

63 See: PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), p.14; Orion "Submission on the cost of capital and the IM review" (5 February 2016), p.1; PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), p.4; CEG (on behalf of ENA) "Key reforms to rate of return under the IMs" (February 2016), para 204 (iv).

120. Price paths with an indexed RAB, accommodate changes to inflation throughout and between regulatory periods. This means that volatility in inflation should not result in step changes at a reset (although there can be some effect created by the balance between return achieved through cash flows versus revaluations). In particular, the effect of treating revaluations as income reduces the volatility in starting revenues (and therefore prices) at the reset.

121. We agree with submissions that suggested the prevailing approach is likely to lead to more volatile estimates compared to alternatives (eg, trailing average approach). However, we do not consider the existence of this volatility is sufficient to warrant a change from the prevailing approach.

122. The impact from this volatility is mitigated due to:

    122.1 the ability of suppliers to enter swap market arrangements and/or issue debt during the determination window to reduce the effect of any volatility from changes to the risk-free rate;[64] and

    122.2 the ability of the regulator to manage any significant changes to consumer prices at the time of each reset through regulatory pricing mechanisms.[65] This is true for any significant price change, which could be due to the WACC or other factors (eg, significant changes to the opex allowance).

123. We consider that these factors are sufficient to ensure the impact of cost of debt volatility from one regulatory period to another can be managed under a prevailing approach and will have limited negative impacts. As a result, we do not propose to change the prevailing approach due to volatility issues.

Our proposed response to the issues raised with our current 'prevailing' approach for estimating the cost of debt

124. Following consideration of the issues, we propose to maintain the current prevailing approach to estimating the cost of debt but, as described in paragraph 115, extend the determination window for both the risk-free rate and debt premium from one month to three months. On balance, we consider that our current 'prevailing' approach provides a better estimate of the cost of debt than any of the alternative approaches we have considered.

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64 As noted previously this is not possible for the debt premium, but the debt premium is a relatively small and stable element of the cost of debt so the impact on the debt premium is likely to be limited.

65 Dr Martin Lally (for QCA) "Review of submissions on the trailing average cost of debt" (27 January 2015), p.9; For example, we set alternative rates of change when setting the original DPP for electricity distribution businesses: Commerce Commission "Resetting the 2010-15 Default Price-Quality Paths for 16 Electricity Distributors" (30 November 2012).

125. We do not consider that the issues raised with the existing approach warrant a significant change to our approach given the disadvantages with the alternatives we have considered.

126. Our consideration of potential alternatives to our current approach is described in the following sections. Three specific alternative options that we considered are:

126.1 implement a trailing average for total cost of debt;

126.2 implement a trailing average for the debt premium ('hybrid') approach;

126.3 keep the prevailing approach, but allow firms to nominate their own determination window.

127. We do not propose to implement any of these options for the reasons described below.

Alternative option 1 – trailing average for total cost of debt

128. An alternative methodology for estimating the cost of debt would be to apply a trailing average approach. This method attempts to replicate an efficient debt-financing strategy for firms with long-lived assets, in which they refinance a portion of their debt every year. The portion is determined by the average length of the debt. Some Australian regulators have moved to a trailing average methodology since the setting of the original IMs. [66]

129. A number of submissions suggested that we change our cost of debt methodology to a trailing average approach.[67] For example, the ENA suggested that:[68]

> The use of a trailing average would promote outcomes that are consistent with those in workably competitive markets. ENBs will have an expectation that they will be compensated for the costs of an efficient debt management strategy and thus can recover the costs of investments. This will promote incentives to invest while still limiting the ability to extract excessive profits.

130. Most submissions on this issue suggested a 10-year trailing average whereby 10% of the debt is refinanced every year. Alternatively, PwC proposed a 5-year trailing average where 20% of the debt would be rolled-over every year.[69]

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66 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), para 3.23.

67 See, for example: ENA "Submission on IM review: Cost of capital" (9 February 2016), para 18; NZ Airports "Submission on Commerce Commission's input methodologies review: Invitation to contribute to problem definition" (21 August 2015), para 69.

68 ENA "Submission on IM review: Cost of capital" (9 February 2016), para 19.

69 PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 88.

131. BARNZ provided a counter view and did not support the use of a trailing average approach to estimate the WACC. It suggested that:[70]

> WACC is predominantly a forward looking concept, designed to identify the cost of capital to a firm going forward, and to provide a measure of the opportunity cost to the firm of using its capital for the particular activity in question, rather than investing in an alternative activity. Since debt costs change with financial market conditions, the average historic cost of debt, taken by itself, is therefore a poor indicator as to the cost of capital a firm is facing when making forward looking investment decisions in respect of the forth-coming pricing period.

132. BARNZ also considered debt market conditions can influence the WACC methodology proposed by suppliers. It suggested:[71]

> It has been BARNZ's experience that during price resetting when the prevailing cost of debt is increasing, that suppliers are only too happy to make use of the prevailing rates. The fact that at times a significant portion of the firm's debt requirements has been fixed at the previously lower rates, enabling the firm to recover more than its actual costs of debt, has not previously been seen as relevant by suppliers with whom BARNZ has consulted over the re-setting of charges.
>
> It is only now that prevailing debt rates are below average debt rates experienced over the last ten to fifteen years, that the concept of a trailing average is being promoted by some regulated suppliers.

133. The general approach when applying a trailing average methodology is to update the cost of debt every year and adjust the price path accordingly. This ensures that the allowance for the cost of debt continually matches the trailing average portfolio. This was the approach suggested by Transpower and CEG (for the ENA).[72] An alternative view was provided by Orion and PwC who were in favour of a move to a trailing average, but did not consider the WACC should be updated on an annual basis.[73]

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70 BARNZ's submission on cost of capital update paper "The use of trailing averages" (5 February 2016), p.1.

71 BARNZ's submission on cost of capital update paper "The use of trailing averages" (5 February 2016), p.1.

72 Transpower's submission "Update paper on the cost of capital" (5 February 2016), p.5; CEG "Key reforms to rate of return under the IMs" (report prepared for ENA, February 2016), para 223; Powerco "Submission on Input methodologies review: Invitation to contribute to problem definition" 21 August 2015, para 56.2.

73 Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 33; PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 90-93.

134. The main benefits of the trailing average are that it counteracts the issues that previously have been identified with the prevailing approach. For example, it is likely to:

134.1 reduce the need for firms to enter into swap market transactions as the trailing average approach is intended to mimic the debt issuance behaviour of a prudent and efficient firm;[74]

134.2 reduce the chance of mismatches occurring between the debt premium paid by suppliers issuing debt and that allowed in the WACC; and

134.3 reduce the chance of significant changes in WACC from one regulatory period to another, as changes to the cost of debt are passed through more gradually through the annual updates.

135. Despite these benefits from a trailing average approach, there are also disadvantages compared to a prevailing approach. A number of these disadvantages are described by Dr Lally in his recent advice and previous reports on this topic.[75] The disadvantages include:

135.1 That using historical rates could blunt the signals from financial costs in relation to new infrastructure investment. This was our main reason for choosing a prevailing approach when setting the original IMs and remains a significant factor.[76]

135.2 The long-term benefits of consumers could be harmed if a supplier requires a significant capex investment but is not incentivised to do so.

135.2.1 This situation may arise if the prevailing cost of debt is significantly higher than the cost of debt allowance provided by a WACC allowance based on a trailing average methodology.

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[74] Although it may reduce the need for swap market transactions, it is unlikely to eliminate them completely. Firms may still enter the swap market to manage their interest rate risk, eg, because their actual debt issuances do not completely mimic that assumed by the regulator, or because they wish to lower interest rate payments by lowering the interest rate term (eg, from 10 years to 3 years), assuming an upward sloping yield curve.

[75] Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016); Martin Lally "The trailing average cost of debt" (19 March 2014), available at: http://www.qca.org.au/getattachment/fdb28fe4-1fe5-4e84-8a59-069ede17883f/The-Trailing-Average-Cost-of-Debt-Lally,-2014.aspx; Martin Lally "Review of submissions on the trailing average cost of debt" (27 January 2015), available at: http://www.qca.org.au/getattachment/1ae4e997-d268-49fe-ab4d-8d0eb12b1977/REVIEW-OF-SUBMISSIONS-ON-THE-TRAILING-AVERAGE-COST.aspx.

[76] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H4.10-H4.13.

135.3 The use of a trailing average regime increases the potential for violations of the NPV=0 principle (and thus increases bankruptcy risk) for both an initial investment and subsequent capex investment.[77]

135.4 If a 10-year trailing average is used it is likely to overcompensate suppliers compared to our prevailing approach. The allowance for the cost of debt would be based on the price of issuing debt with a term of 10 years, rather than five years.[78] The average price of the 10-year debt is likely to be higher than the five-year debt assuming an upward sloping yield curve.[79]

135.5 Moving from a prevailing approach to a trailing average approach would be a substantial policy change in the approach to estimating the cost of debt. This would potentially incur significant one-off regulatory cost both in terms of administrative costs of implementing the change and the impact on the conditional regulatory predictability that the IMs are intended to promote.[80,81]

135.6 A transition to a trailing average approach is likely to be subject to significant debate.[82] Any decision on the approach to transition is likely to result in a significant one-off impact on suppliers and consumers. We also note that a transition to a trailing average by the Australian Energy Regulator (**AER**) in

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77 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.9-10.

78 We note that under the prevailing approach we allow for a TCSD allowance to compensate for the additional debt premium and the interest rate swap execution costs that can be incurred from issuing debt with a longer term than five years.

79 As noted in the High Court High Court judgment, firms make use of the swap market to reduce the higher interest rate it pays on longer-term debt (assuming upward sloping yield curve) by reducing its interest rate pricing term. A regulatory decision that does not take into account the potential for firms to reduce their costs in this way is likely to overcompensate companies for their cost of debt. PwC suggested a five-year term, however this would no longer result in a broad replication of the cost of debt of an efficient firm (which issues debt with an original term to maturity longer than five years) and so some of the advantages of a trailing average approach would not be realised.

80 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.21.

81 We discuss further what we mean by regulatory certainty in Commerce Commission "Input methodologies review draft decisions: Framework for the IM review" (16 June 2016).

82 The lack of clarity is underlined by the apparent contradiction in Transpower's submission described by Martin Lally on their views for the appropriate transition arrangements: Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.32.

Australia has been subject to significant debate and an ongoing appeals process.[83]

135.7 Annually updating the price path to take into account a revised cost of debt would be an additional administrative burden. This is particularly true for DPPs and CPPs where there is not currently an annual update to the price-quality path.

136. Although there are some benefits of moving to a trailing average regime (described in paragraph 134), in our view these are not outweighed by the disadvantages (described in paragraph 135). Therefore we do not propose to introduce a trailing average methodology to estimate the cost of debt for price-quality paths.

137. The advantages of using a trailing average approach for ID regulation appear slightly stronger than the situation in which the WACC is used to determine the allowance for return on capital under a price-quality path. A more stable estimate of WACC may provide benefits to interested parties when assessing supplier profitability using disclosed information.[84]

138. However, we do not consider this benefit would be substantial in assessing profitability because:

138.1 We agree with Dr Lally that any assessment of ex-post profitability should take place over number of years. This ensures that any conclusions are not overly influenced by one-off factors in particular years that may give a false sign of excessive profitability. When assessing profitability over a longer period of time the advantages of a trailing average over a prevailing approach become more limited;[85] and

138.2 To date our assessments of supplier profitability have been generally undertaken on an ex-ante basis using the WACC applied at the start of a price-quality path or price setting event (for airports).[86] Under these circumstances, the methodology to determine the annual WACC for ID is not

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83 The Australian Competition Tribunal overturned the AER's decision on the transition methodology when the AER decided to move to a trailing average approach. The Tribunal's decision is now subject to judicial review. See: Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1, at [924].

84 In the event that a prevailing approach is used and a business smooths its prices, excess returns may be observed for a single year, although they would not necessarily be as a result of excessive pricing. See: Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.13-14.

85 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.13-14.

86 For example: summary analysis of EDB profitability, 56G reports for airports.

as significant because we generally use the WACC set at the start of the price-quality path/price-setting event.

139. Given the limited benefits in applying a trailing average approach to determine the WACC for ID, we do not propose to introduce a trailing average for this purpose.

140. On balance, we consider that our current prevailing approach provides a better estimate of the cost of debt for ID than this alternative .This is because of the:

140.1 administrative costs of introducing a trailing average approach; and

140.2 additional complexity that arises if the approach for ID diverges from the approach taken for price-quality regulation.[87]

Alternative option 2 – trailing average for the debt premium ('hybrid') approach

141. A second alternative option is to apply a trailing average approach but only to the debt premium, not the total cost of debt. This option has been called the 'hybrid' approach.[88]

142. No submissions specifically requested this variant of the trailing average, but we noted in the WACC update paper that it had been introduced by the ERAWA.[89] The advantage of this option is that it reduces the potential for mismatches in the debt premium incurred by a regulated supplier (assuming it issues debt on an annual rolling basis) and that provided in the cost of debt estimate.

143. However, it does not solve the other identified issues with the prevailing approach:

143.1 A prevailing approach is used for the risk-free rate and so it does not reduce the level of swap transactions (and costs) required.

143.2 It is likely to have limited effect on total price volatility from regulatory period to the next, because the debt premium is only a relatively small proportion of the total cost of debt.

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87 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.10-11.

88 Submissions have not specifically requested this approach, however it has previously been raised as potential option in the WACC update paper and evaluated as part of this review because we consider that one of the main disadvantages of the prevailing approach is the potential for mismatches in the debt premium. Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), 3.29.3.

89 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), 3.23.3.

144. Disadvantages when applying the hybrid approach are that:

144.1 There is the potential for negative incentive effects for new investment from using a historic averaging approach. This has been illustrated by Dr Lally in his report, which suggests that NPV=0 violations are higher for a debt premium calculated using a trailing average compared to one calculated using a prevailing rate.[90]

144.2 Broad replication of an efficient debt strategy would only arise after a transitional period (eg, 10 years), if we introduced a trailing average for the debt premium immediately. It would depend on the timing of previously incurred debt and means that any immediate imposition of this methodology is likely to be subject to significant debate.

144.3 There will be an additional administrative burden from annual updating of the debt premium and updating the price-quality path.[91]

145. As noted in paragraph 108.3, use of a prevailing rate for the debt premium is also likely to partly offset MRP estimation errors, which further reduces the rationale for a change.

146. On balance, we consider that our current trailing average approach provides a better estimate of the cost of debt than this hybrid alternative. We recognise that this has not been the focus of submissions to date and we welcome any further evidence on this approach.

Alternative option 3 – firms to nominate their own determination window

147. We have previously suggested an option that allows a firm to choose the determination window based on which specific WACC would be estimated.[92] This could potentially help mitigate the potential for additional swap market distortions/costs from using a single month as the determination window.

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90 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.9-11.

91 This is particularly the case for EDBs and GPBs who do not currently have an annual adjustment to their price-quality path.

92 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), para 3.34.4.2.

148. Submissions from the ENA and Wellington Electricity both supported the option for suppliers to nominate their own determination windows in the event that a prevailing approach is maintained.[93] Wellington Electricity suggested that:

> To better manage the risks associated with a narrow re-pricing window, WELL proposes that the Commission allow businesses to nominate their own averaging period rather than having a fixed averaging period for all businesses. This would also help businesses lower their actual debt management costs.

149. We consider that supplier-specific determination windows may provide some benefit in reducing the swap market transactional costs. However, it would result in some additional complexity to the regime. This complexity may arise both in different WACC values being applied to different suppliers (for example, under the same DPP) which may impact on comparability as well as the process for firms to nominate specific periods.

150. The optionality inherent in firms being able to nominate their own determination windows could potentially lead to gaming opportunities, depending on the precise mechanism implemented.

151. Although we consider this type of approach might be possible under our regime, we do not consider that the issues it is intended to mitigate are significantly large to justify this change to the methodology. As noted in paragraph 115, we propose to extend the length of the determination window. This should reduce any potential swap market distortions by spreading out the period over which businesses obtain swaps.

152. We, therefore, do not propose to allow a supplier to nominate its own determination window.

Submitters proposed that we update the WACC annually (indexation)

153. The current IMs apply a single WACC to a price-quality path for the length of the regulatory period. There is no revision to the cost of debt element of the WACC during this time.

154. Dr Lally outlines that, because the WACC is fixed over the price-quality path, it can lead to mismatches between the debt premium set at the start of the path and the actual debt premium incurred by suppliers if they regularly issue debt over the course of the regulatory period.[94]

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93 Wellington Electricity "Input methodologies review – Cost of capital" (9 February 2016), p.4; CEG "Key reforms to rate of return under the IMs" (report prepared for ENA, February 2016), para 234.

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

155. The mismatches take place in both directions and lead to a violation of the NPV=0 principle. Dr Lally also explains that because firms have some discretion in when they invest in new capex, these mismatches will not necessarily wash out, so he favours annual updates to the debt premium element of the cost of debt.[95]

156. Submissions from stakeholders had differing views on how annual updating should be considered. For example, Transpower considered that it is inherently linked to the choice of whether to apply a trailing average:[96]

> The Update Paper has separated issues to do with the trailing average approach and the question of whether the cost of debt allowance should be indexed through the regulatory period. Transpower views these as closely linked issues that should be considered together

157. However, PwC considered that they were separate issues.[97]

> We agree with the Paper that annually updating the risk-free rate and/or debt premium is a distinct issue from the use of trailing averages, and should be considered separately

158. Although we agree with the points made by Dr Lally, on balance, we do not consider that this is a significantly material issue.[98] We do not consider that the introduction of annual updates to the debt premium would provide sufficiently material long-term benefits to consumers that would justify the administrative costs of an annual update process. We also note that there is no support from stakeholder submissions to annually update the cost of debt in the absence of the introduction of a trailing average. On this point Transpower suggested:[99]

> There would be no good reason to implement indexation of the return on debt without also applying a trailing average. This would introduce significant volatility into regulated prices because the cost of capital would be reset in each year according to the prevailing rate, which can vary significantly from year to year. Neither increased volatility nor increased costs is in the interests of consumers or suppliers and is likely to result in suppliers entering more expensive hedging arrangements.

159. We therefore propose to maintain the current approach that fixes the WACC (and thus the cost of debt) for the length of the regulatory period.

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95 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p16-17.

96 Transpower's attachment to their submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.19.

97 PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), p.90.

98 We recognise there may be other practical implementation complications for example, maintaining a real return under indexing may be complicated if we wished to try and control for this.

99 Transpower's attachment to their submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.19.

Issues raised with our debt premium methodology

160. Our current approach to estimating the debt premium involves a degree of judgement. When estimating the debt premium, we consider yields to maturity for a pool of corporate bonds issued by companies that have similar characteristics to a notional benchmark supplier that we specify. This approach often results in upper and lower bounds, within which judgement is required to determine a point estimate of the debt premium.

161. Although we consider that the current approach to estimating the debt premium has worked relatively well, the relatively thin New Zealand bond market can sometimes lead to difficulties when determining a specific debt premium estimate. For example, CEG (for the ENA) submitted that:[100]

    161.1 focussing on debt issued by regulated EDBs materially reduces the number of observations available, in a context where it is not obvious that there is any advantage from doing so; and

    161.2 with an expanded bond set, we should also consider curve fitting and other statistical techniques that would allow more intensive and efficient extraction of information from a sample of bonds.

162. We have investigated potential improvements that could be made to our current approach. In particular, we have considered the following two potential changes to our debt premium methodology.

    162.1 *Should we stop placing less weight on bonds issued by companies that are majority owned by the government?* Removing this restriction would increase the size of the core sample of bonds used to determine our debt premium estimate, helping alleviate difficulties associated with the small pool of relevant corporate bonds that we currently rely on.

    162.2 *Should we use a more mechanical approach to estimating the debt premium?* A more mechanical approach would reduce the degree of judgement required when determining our debt premium estimates.

Outline of our current approach to estimating the debt premium

163. Under our current approach, we estimate a service-specific (rather than supplier-specific) debt premium. We follow a 'simple approach' which involves three steps:[101]

    163.1 identifying credit-rated publicly traded vanilla corporate bonds denominated in New Zealand dollars, issued by the regulated service in question in New

[100] CEG "Key reforms to rate of return under the IMs" (report prepared for ENA, February 2016), paras 231-232.

[101] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), para H5.30.

Zealand (and, as a cross-check, issued by other infrastructure businesses which are not the regulated service in question);

163.2 obtaining the market yield to maturity on these bonds and the contemporaneous risk-free rate, and estimating the debt premium by taking the difference between the two; and

163.3 estimating, by interpolation, the debt premium for a term to maturity equal to the regulatory period, consistent with a specified Standard and Poor's (**S&P**) long-term credit rating (or equivalent rating from Moody's or Fitch), for bonds issued by suppliers of the regulated service in question.

164. For example, for EDBs, Transpower, and GPBs, we estimate the average debt premium that would reasonably be expected to apply to publicly traded vanilla New Zealand dollar denominated corporate bonds that:

164.1 are issued by an EDB or GPB that is neither majority owned by the government nor a local authority;

164.2 have a S&P's long-term credit rating of BBB+ (or equivalent rating from Moody's or Fitch); and

164.3 have a remaining term to maturity of five years.[102]

165. However, there are very few (if any) publicly traded bonds in New Zealand that match the characteristics described in paragraph 164. In particular, there have not been any BBB+ rated bonds issued by EDBs or GPBs included in our IMs WACC determinations since April 2013.

166. Given the small number of EDB/GPB issued bonds with a BBB+ credit rating, we also consider bonds issued by companies that are not EDBs or GPBs, or have credit ratings other than BBB+. When determining our debt premium estimate, we place progressively less weight on the available publicly traded bonds in the order listed below:[103]

166.1 bonds issued by an EDB or a GPB (that is neither majority owned by the Crown nor a local authority) with a rating of BBB+;

166.2 bonds issued by another entity (that is neither majority owned by the Crown nor a local authority) with a rating of BBB+;

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[102] We also currently estimate three and four year debt premiums for CPP proposals.

[103] We only consider bonds issued by New Zealand resident limited liability companies that undertake the majority of their business activities in Australia or New Zealand and do not operate predominantly in the banking or finance industries.

166.3 bonds issued by an EDB or a GPB (that is neither majority owned by the Crown nor a local authority) with a rating other than BBB+;

166.4 bonds issued by another entity (that is neither majority owned by the Crown nor a local authority) with a rating other than BBB+; and

166.5 bonds issued by entities that are majority owned by the Crown or a local authority.

167. We follow the same approach outlined in paragraph 163 when estimating the debt premium for airports, except we use a benchmark credit rating of A- (rather than BBB+) and most weight is placed on bonds issued by airports (rather than EDBs or GPBs).

Should we stop placing less weight on bonds issued by companies that are majority owned by the government?

168. As noted in paragraph 166.5, we currently place least weight on bonds that are majority owned by the Crown or a local authority when we estimate the debt premium. This is because, holding other factors constant, we considered that government ownership would generally be expected to lower the observed debt premium on a bond.[104]

169. Our current approach significantly limits the sample of bonds relied on when estimating the debt premium. Figure 3 shows debt premium estimates using data for the three months from January to March 2016, with majority government-owned companies listed under category 4(e). This figure shows that:

169.1 half of the companies we currently consider when estimating the debt premium are majority owned by the government; and

169.2 four of the five majority government-owned companies in the sample issue bonds with a BBB+ credit rating.

[104] Government ownership could be expected to reduce the observed debt premium on a bond if investors anticipate that the government will step in if the issuer is in financial trouble (reducing the risk of default).

Figure 3: NZ corporate bonds considered when estimating the debt premium[105]

Subclause	Issuer	Note ref.	Industry	Rating	Remaining term to maturity	Debt premium
4(a)	-		-	-	-	-
4(b)	WIAL	1	Other	BBB+	5.0	1.62
4(c)	-		-	-	-	-
4(d)	Spark	2	Other	A-	5.0	1.39
	AIAL	3	Other	A-	5.0	1.30
	Contact	4	Other	BBB	5.0	1.83
	Fonterra	5	Other	A-	5.0	1.46
4(e)	Meridian	6	Other	BBB+	7.0	1.75
	Genesis Energy	7	Other	BBB+	5.0	1.65
	MRP	8	Other	BBB+	5.0	1.76
	CIAL	9	Other	BBB+	5.0	1.58
	Transpower	10	Other	AA-	5.0	1.10

Notes on bonds analysed:

1 WIAL 5.27% bond maturing 11/06/2020; 6.25% bond maturing 15/05/2021.

2 Spark 5.25% bond maturing 25/10/2019; 4.5% bond maturing 25/03/2022.

3 AIAL 4.73% bond maturing 13/12/2019; 5.52% bond maturing 28/05/2021.

4 Contact Energy 5.28% bond maturing 27/05/2020; 4.40% bond maturing 15/11/2021.

5 Fonterra 5.52% bond maturing 25/02/2020; 4.33% bond maturing 20/10/2021.

6 Meridian 4.53% bond maturing 14/03/2023.

7 Genesis Energy 8.3% bond maturing 23/06/2020; 4.14% bond maturing 18/03/2022.

8 MRP 8.21% bond maturing 11/02/2020; 5.79% bond maturing 6/03/2023.

9 CIAL 5.15% bond maturing 6/12/2019; 6.25% bond maturing 4/10/2021.

10 Transpower 6.95% bond maturing 10/06/2020; 4.3% bond maturing 30/06/2022.

170. However, in practice, government ownership appears to have had a limited effect on the observed debt premiums for publicly traded New Zealand bonds. If anything, government ownership appears to have had the opposite effect to that expected. The debt premium data we have collected since the cost of capital IMs came into effect (in December 2010) indicates that government ownership has had a positive effect on debt premiums since 2013.

[105] The five-year debt premiums are calculated by linear interpolation with respect to maturity.

171. Most of the government-owned companies in the sample of bonds we consider are electricity gentailers (ie, Meridian, Genesis, and Mighty River Power), which could explain the limited impact of government ownership we have observed. Due to the competitive nature of electricity generation and retailing, the government would not necessarily be expected to bail out these companies if they experienced financial difficulty.[106]

172. Given that government ownership appears to have had limited effect on observed debt premiums in recent years, we no longer intend to place reduced weight on bonds issued by companies that are issued by the Crown or a local authority. Removing this restriction will increase the number of bonds we are able to place significant weight on when estimating the debt premium (particularly for EDBs, Transpower and GPBs, given the high proportion of BBB+ bonds that are majority government-owned).

Should we use a more mechanical approach to estimating the debt premium?

173. In conjunction with the Victoria University Business School, we initiated a summer research project focussing on assessing potential alternative approaches that could be used to estimate the debt premium for services regulated under Part 4. The research focussed on the NSS yield curve approach, which is described in more detail in Attachment C.

174. We consider the NSS yield curve is a useful methodology that could assist us in estimating the debt premium. The NSS approach has strong theoretical foundations, and is an established approach used by central banks around the world. The NSS yield curve can represent a non-linear term structure, and allows the debt premium to be observed at any term to maturity. The NSS curve is also relatively simple to determine, and would reduce the need for judgement when estimating the debt premium.

175. However, there is currently limited experience in developing NSS curves using New Zealand bond data, suggesting some caution may be appropriate before adopting this approach.

176. We propose to have regard to the NSS curve when estimating the debt premium. We intend to generate the curve by:

    176.1 using three months of debt premium data from individual corporate bonds;

    176.2 determining individual data points by using monthly average yields to maturity for each bond; and

[106] We also note the recent insolvency of Solid Energy, which is government owned.

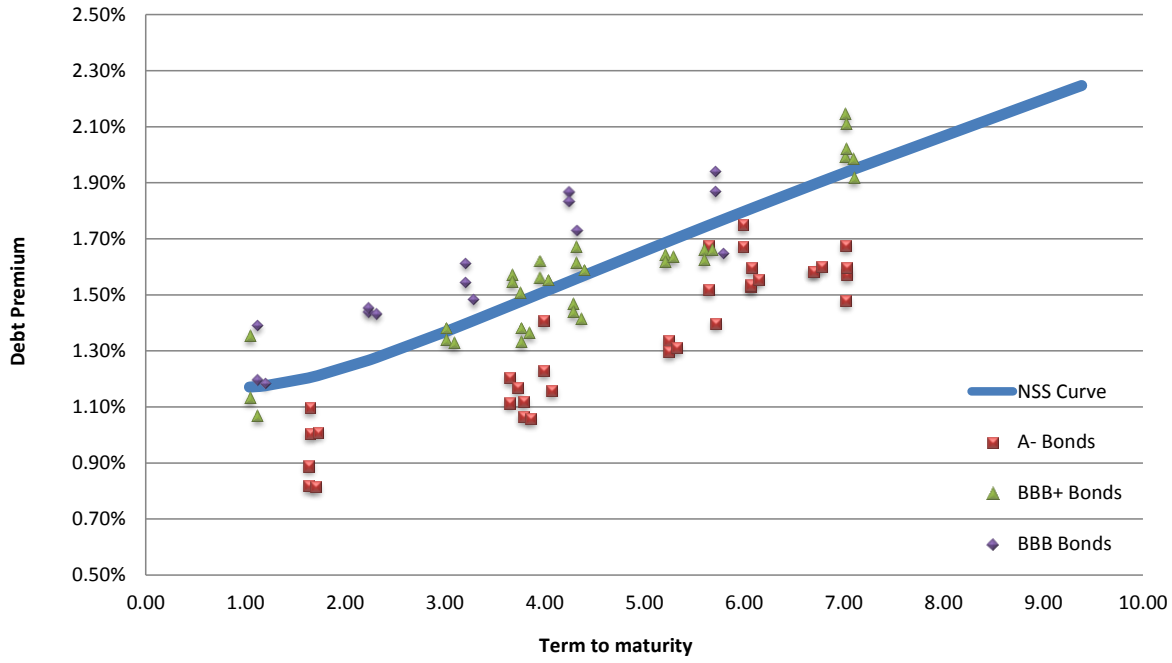
176.3 calculating a NSS curve using an excel optimisation process, including dummy variables for bonds with different credit ratings, based on the function in Equation 1.[107]

Equation 1: NSS function (including dummy variables for bonds with different credit ratings)

$$DRP(t) = \beta_1 + \beta_2\left[\frac{1-e^{(-\frac{t}{\lambda_1})}}{t/\lambda_1}\right] + \beta_3\left[\frac{1-e^{(-\frac{t}{\lambda_1})}}{t/\lambda_1} - e^{(-\frac{t}{\lambda_1})}\right] + \beta_4\left[\frac{1-e^{(-\frac{t}{\lambda_2})}}{t/\lambda_2} - e^{(-\frac{t}{\lambda_2})}\right] + \beta_5 BBB + \beta_6 A -$$

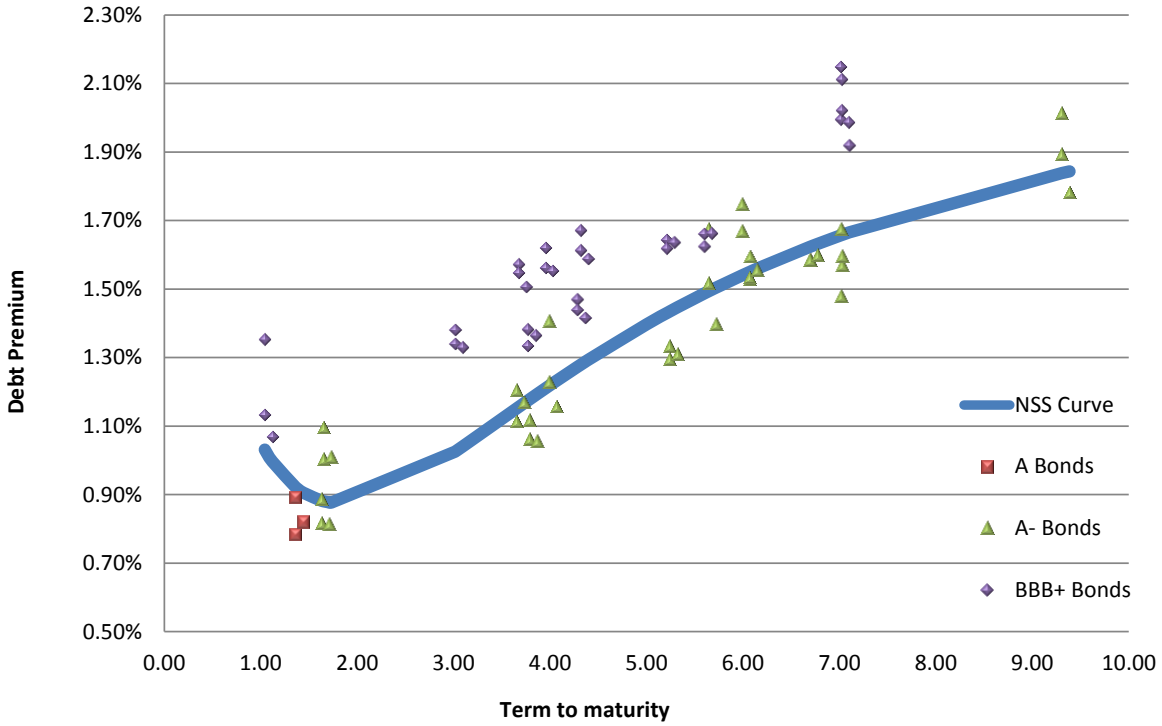
177. NSS curves for the three-month period from January 2016 to March 2016, based on the approach outlined in paragraph 176 and Equation 1, are included in Figure 4 and Figure 5. Further detail regarding the approach to estimating NSS curves is contained in Attachment C.

Figure 4: NSS curve for EDBs, Transpower and GPBs debt premium (January – March 2016)



[107] Bonds that match the target credit rating, or are one notch either side of the target credit rating, will be included. For EDBs, GPBs and Transpower, BBB, BBB+ and A- rated bonds will be used, as shown in Equation 1. For airports, BBB+, A- and A rated bonds will be used.

Figure 5: NSS curve for airports debt premium (January – March 2016)



178. Following this approach, debt premiums for a five-year term to maturity can be estimated using the NSS yield curves. For example, based on the curves Figure 4 and Figure 5, the five-year debt premium for EDBs/Transpower/GPBs is 1.66% and the five-year debt premium for airports is 1.40%.

179. According to the European Central Bank, there are four main reasons for the popularity of the Nelson-Siegel model: [108]

179.1 the model is easy to estimate;

179.2 the yield curve can provide estimates for all maturities (ie, bonds not observable in the market);

179.3 factors have intuitive interpretation so that estimations and conclusions are easily communicated from the model; and

179.4 the model has been proven to fit data well.

[108] European Central Bank (2008) https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp874.pdf?4b32dc2539d2598c420ec5e96a3891f7.

Issues raised with our approach to the term credit spread differential

Issues with the current approach

180. The cost of capital IM allows companies a TCSD allowance to compensate for the additional debt premium and the interest rate swap execution costs that can be incurred from issuing debt with a longer term than the five-year regulatory period.

181. 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 issued long-term debt to prudently manage their refinancing risks.

182. A number of issues have been raised on the current IM concerning the compensation for the debt premium associated with longer-term debt. These include:

182.1 *High Court comments*: The High Court judgment on the setting of the original IMs suggested that the Commission "review the efficacy of the TCSD" so that it may be able to be better articulated and connected with market practice.[109]

182.2 *TCSD implementation issues*: There are a number of implementation issues with the current application of the TCSD, including the ability to obtain appropriate data, its complexity and that it potentially undercompensates for longer-term debt.[110]

183. Submissions from suppliers generally maintained the view that a TCSD is required in the absence of a longer benchmark term for the debt premium. However, they note its complexity can cause issues. For example PwC suggested:[111]

> We note that the current alternative, the TCSD, has proven to be complex for EDBs to implement in practice. We also note that it may be possible to develop a different mechanism which provides an explicit allowance for longer-term debt, which is more straightforward to apply than the TCSD.

Proposed approach

184. Our proposed approach is to maintain the TCSD but make changes to its implementation. We have reviewed the rationale behind the TCSD and still consider that the additional debt premium incurred by suppliers when issuing debt that has an original tenor greater than the (five-year) regulatory period is a legitimate expense for an efficient supplier. In reaching our draft view, we have considered alternative options, in which the TCSD is removed (as proposed by the High Court), and these are described in subsequent sections.

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109 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1288].

110 In particular, the IMs require the TCSD to be calculated by reference to a Bloomberg NZ 'A' fair value curve, which is no longer published. An amendment was therefore made to Transpower's IM which enables it to use an equivalent reference to calculate the TCSD.

111 PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 99.

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

185.1 the additional debt premium associated with each issuance of debt that has an original term to maturity in excess of over the five-year debt premium (the 'spread premium');[112]

185.2 an allowance for swap costs; and

185.3 a negative adjustment to take account of the lower per annum debt issuance costs that are associated with longer-term debt.[113]

186. An additional allowance is then available for qualifying firms based on the size of their debt portfolio and the value of the TCSD. [114]

187. The current IMs require firms to calculate the spread premium and swap cost individually based on market data on the date the bond is issued, subject to minimum and maximum values.

188. This leads to a significant administrative burden on suppliers. Data issues also mean that the TCSD allowance is unlikely to be representative of the true costs of the spread premium. The observed data shows that there is often an inverse relationship between the original term of the debt and the TCSD allowance.[115]

189. As a result, we propose two modifications to the TSCD methodology:

189.1 Implementation of a fixed relationship between the value of the spread premium and the original term of the debt in excess of the benchmark five-year term based on historical data.[116]

189.2 Removal of the swap cost element of the TCSD. Instead the allowance for swap costs will become part of the allowance for debt issuance costs.

190. The advantages of this proposed revised approach are that:

190.1 it reduces the complex administrative burden associated with the TCSD – this is particularly relevant given that it forms a relatively small element of the cost of capital;

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112 This debt is called 'qualifying' debt.

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

114 Those firms that have a debt portfolio, as at the date of that supplier's most recently published audited financial statements, that has a weighted average original tenor greater than five years.

115 For further details see Attachment B.

116 Using NZ domestic bond data from 2010 to 2016 we have determined a linear relationship between term and the additional premium over the average five-year debt premium. For further details see Attachment B.

190.2 there is no longer a requirement to obtain market information when estimating the TCSD; and

190.3 it will always provide a positive relationship between the TCSD allowance and original term of the debt.

Approach for airports

191. We have estimated a separate relationship between the value of the spread premium and term for energy businesses (which have a BBB+ credit rating) and airports (which have an A- credit rating). Table 35 in Attachment D shows how the positive spread premium for airports is more than offset by the lower per annum debt issuance costs that arise from issuing longer-term debt.

192. Because of this outcome, we propose to remove the TCSD allowance for airports because under our revised approach the value would always be zero.[117]

Alternative option 1 – remove the term spread credit differential

193. An alternative to modifying the TCSD would be to remove it completely and not provide compensation for longer-term debt.

194. The High Court judgment in 2010 indicated that this would be its preferred approach, given the term of debt was set at five years for the regulatory period:[118]

> Given the view we take of the basic issue of principle (that to avoid under and over compensation the risk-free rate should be matched to the regulatory period), the material before us has not persuaded us of the need for a TCSD at all.

195. Contact Energy (**Contact**) also submitted that removing the TCSD was an appropriate option for three reasons:[119]

> The Commission already uses an appropriate market proxy and the defined regulation period when looking at credit rating, leverage and duration of debt. To vary from this is a choice of the firm around how much maturity risk they want, not a cost consumers should cover.
>
> Longer duration debt comes with lower per annum debt establishment costs that would offset the higher cost.

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117 The TCSD applied to airports is not defined in the input methodologies. Instead it is defined in the information disclosure determination. The proposed changes to the information disclosure determination published alongside the IM review draft decision are only ex ante amendments, ex post will be considered as part of a separate process.

118 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1285].

119 Contact Energy [PUBLIC] "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), p.11.

> Regulated Network Service companies that choose to fund with shorter (or cheaper) debt do not see an additional revenue reduction to offset this. The principle of consumers paying for longer term debt and not being reimbursed for shorter debt is one sided.

196. We agree that not applying a TCSD is one potential option, given the benchmark term of five years. However, maintaining the TCSD allows us to compensate for any additional costs (ie, an increase in the debt premium) that are incurred by supplier that issues debt with original tenors longer than five years.

197. If the TCSD was removed and we maintained a five-year term for the cost of debt, there would no compensation for the additional debt premium incurred by firms that issue debt with original tenors longer that the five-year benchmark debt term. Compensation under the TCSD is only provided for costs which are not offset by a reduction in the per annum debt issuance costs, that result from having a longer tenor.

198. A prudent supplier may issue debt for longer than five years to reduce the refinancing risk associated with assets that have long economic and engineering lives.[120] We consider that a supplier financing assets to reduce refinancing risk in this way is likely to be providing long-term benefits to consumers, and this is why we continue to consider that including a TCSD helps provide the best estimate of a cost of capital incurred by prudent suppliers.

199. However, we also agree with the High Court's view that "to avoid under and over compensation the risk-free rate should be matched to the regulatory period". This is consistent with the expectation that a supplier would then use the swap market to reduce its interest rate re-pricing period to be consistent with our benchmark term of debt. That is why we consider that the only appropriate additional costs incurred from the issuance of longer-term debt, which should be compensated for under the TCSD, will be related to the debt premium and not the risk-free rate.

200. The TCSD calculation takes into account the lower annual issuance costs associated with debt that has a longer original maturity term. As shown in Attachment D this appears to eliminate the need for a TCSD for airports (which are A- rated) because the debt issuance cost adjustment outweighs the additional spread premium. However, this is not the case for BBB+ rated bonds and so a TCSD is still required.

201. We recognise that the TCSD provides a slightly asymmetrical approach because it does not provide a negative adjustment for firms that issue shorter-term debt (ie, debt with an original tenor that is less than five years). However, it is a practical approach (consistent with the materiality of associated costs) that provides a small incentive for firms to issue longer-term debt consistent with the actions of a prudent supplier.

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[120] For example, regulated suppliers often have assets with lifetimes up to 50 years.

Alternative option 2 – remove the TCSD and extend the benchmark term of the debt premium

202. A number of suppliers have suggested that a better option would be to remove the TCSD and instead increase the term of the debt premium (or total cost of debt). Most suppliers have suggested a debt term of 10 years is appropriate.[121]

203. We used a specific estimate for the debt premium when determining the cost of capital for the unbundled copper local loop (**UCLL**)/unbundled bitstream access (**UBA**) pricing review. In that situation we did not apply a TCSD but instead used a 7-year term to determine the debt premium single hypothetical efficient operator.[122]

204. CEG (for the ENA) suggested that this decision means we have accepted the logic that we should set a benchmark term for the debt premium in excess of the five-year regulatory period.[123] However, this is incorrect because the debt premium determined for the UCLL/UBA decision was in a different context. Under that process we were determining the cost of capital for a hypothetical efficient operator and for which no information on actual debt issuance is available.

205. We do not consider the approach in the IM is comparable, because we separately estimate a TCSD allowance for individual firms on the basis of the actual debt issuance practices. This approach was developed in 2010 because the 2010 confidential debt survey showed that 24 suppliers out of 29 had a weighted average term to maturity that was less than the regulatory period, and we did not want to compensate these firms for costs that they did not actually incur.[124]

206. We still consider that this approach is appropriate because the recent 2016 confidential debt survey showed that 23 out of 30 regulated suppliers had a weighted average term to maturity that was less than the regulatory period.

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121 MDL, Untitled submission on cost of capital update paper (5 February 2016), p.5; Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 6; Transpower's attachment to their submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.26.

122 Commerce Commission "Cost of capital for the UCLL and UBA pricing reviews " (15 December 2015), para 82.

123 CEG "Key reforms to rate of return under the IMs" (report prepared for ENA, February 2016), 169.

124 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), paras H5.12-H5.13.

207. Dr Lally has suggested that this approach potentially provides an incentive for firms to issue debt for even longer periods.[125] Although this may be true, we do not consider this disadvantage to result in a significant cost to consumers. This is especially true when we consider that:

207.1 consumers would not have to pay the additional debt premium to firms that are not in fact issuing debt with original maturity terms longer than regulatory period; and

207.2 in general we do not wish to discourage firms from issuing longer-term debt to reduce refinancing risk.

208. On balance, weighing up the factors discussed above, we consider that our current approach to the TCSD leads to a better estimate of the cost of debt, and reduces administrative complexity to suppliers, than either of the alternatives discussed.

Our approach to estimating the key cost of debt parameters

209. The previous section considered the key identified issues related to the cost of debt that were raised and considered as part of the IM review. This section summarises our approach to estimating each of the key parameters that are required to estimate the cost of debt.

Risk-free rate

210. The risk-free rate is the interest rate that an investor would expect to earn by holding a risk-free asset. We use the risk-free rate when estimating both the cost of debt and the cost of equity.

211. The previous IMs outlined how there were five steps to determining a suitable risk-free rate:[126]

211.1 identify a suitable proxy, given the true-risk-free rate cannot be observed;

211.2 determine whether to use prevailing or historical interest rates;

211.3 determine whether to use spot rates or yields to maturity;

211.4 determine the averaging period and the length of time the risk-free rate is fixed; and

211.5 determine an appropriate maturity term.

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125 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.20.

126 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), H4.3.

212. We have reviewed our approach to each of these steps to ensure the IMs are still appropriately estimating a risk-free rate.

Identifying a suitable proxy

213. We propose to maintain the use of government bond rates as a proxy for the risk-free rate. Suppliers were split on this issue, PwC submitted that that there was not sufficient evidence for a change,[127] while Transpower and CEG (on behalf of the ENA) supported the use of a swap rate instead of government bonds. The main rationale for using a swap rate is because it is difficult to hedge a government bond, and therefore, suppliers can be exposed if there is not perfect correlation between the swap rate and the risk-free rate.[128]

214. Dr Lally has identified this risk as small,[129] and we also note the use of swap rates as proxy for the risk-free rate by overseas regulators remains limited.[130] As a result, we see limited benefit in changing the proxy to the New Zealand swap rate and so propose to continue to use government bond rates.

Other steps in estimating the risk-free rate

215. Our proposed approach to the remaining steps in estimating the risk-free rate is as follows:

    215.1 We propose to maintain the use of prevailing rates as described in paragraphs 90 to 127.

    215.2 We propose to maintain the use of yield to maturity as an approximation of spot rates due to the difficulties in obtaining spot rate data.[131] No submissions were received on this point.

    215.3 We propose to extend the averaging period to three months and fix the risk-free rate for the duration of a five-year regulatory period.[132]

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127 PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 64.

128 Transpower's attachment to their submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.20; CEG "Key reforms to rate of return under the IMs" (report prepared for ENA, February 2016), para 168.

129 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.8.

130 We note CEG's submission that identifies that that ERAWA has used swap rates as a proxy for the risk free rate. CEG "Key reforms to rate of return under the IMs" (report prepared for ENA, February 2016), para 193.

131 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), H4.19.

132 This is an extension to the one month determination window in the original IMs.

215.4 We propose to maintain the maturity term of the risk-free rate at five years so that it is consistent with the regulatory period.

Debt premium

216. The debt premium reflects the additional risk an investor is exposed to when lending to a borrower other than the government.

217. Following the review of the debt premium methodology, we propose to make the following modifications:

217.1 expand the averaging period from one month to three months;

217.2 remove restrictions of the use of bonds from firms that are majority owned by the government or local authorities; and

217.3 have regard to the debt premium estimated from fitting a NSS curve to the bond data.

Issuance costs

218. The current IMs recognise that fees and costs associated with prudent debt issuance and refinancing costs are legitimate expenses that should be compensated for, and currently provides a 35 bps p.a. allowance.

219. We have previously considered that this allowance is generous because it is higher than our finding from the 2010 confidential debt survey that the average debt issuance cost is 0.22% p.a. and is greater than similar costs allowed by overseas regulators.[133] The High Court judgment on the appeals to the original IMs agreed with the assessment that the debt issuance costs were generous to suppliers.[134]

220. The current IMs provide an allowance to cover the execution costs of a single interest rate swap as part of the TCSD. This means that the cost of executing an interest rate swap is only provided for debt with an original maturity term longer than five years for qualifying suppliers.

221. We propose to change this restriction and provide general allowance for the cost of executing swaps as part of the debt issuance costs. We consider that an efficient supplier may engage in swap transactions when managing its interest pricing risk even if the debt does not have an original maturity term that is greater than five years: for example, if a firm issues debt on a rolling five year basis.

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133 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), 6.3.39.

134 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1370].

222. This is consistent with a suggestion from Contact:[135]

> We note swap costs were not included in the Commission's October 2014 cost of capital determination. These are a component of debt issuance costs incurred by firms and we would see these better as part of issuance costs than recovered through operating costs.

Confidential debt survey

223. To help review the suitability of our current estimate of issuance costs, we undertook a confidential debt survey of regulated suppliers. From this survey we identified 19 vanilla NZ domestic bonds that are equivalent to the type of bond from which we estimate the debt premium. The average issuance cost provided in the debt survey of these bonds was 6 bps p.a. when averaged over the original maturity term of the bond, and 7 bps p.a. when the costs are assumed to be averaged over a five-year term.

224. In addition to the estimate of the debt issuance costs, the confidential debt survey also provided information from suppliers on the cost of executing an interest rate swap. Data from the survey suggested the average cost of an interest rate swap as about 2 bps p.a.

Evidence from submissions – debt issuance costs

225. Evidence from submissions on appropriate debt issuance costs was varied.

226. Contact provided a breakdown of debt issuance costs that suggested an issuance cost of 5 bps p.a. for a NZ domestic bond. It also suggested that issuance costs have fallen since 2010 because regulatory reforms had lowered the cost for repeat issuers.[136]

227. Suppliers, on the other hand, suggested our allowance was not sufficient because it did not include the costs of:

    227.1 standby bank facilities;[137]

    227.2 the costs of issuing debt in foreign markets;[138]

    227.3 the costs of maintaining a credit rating with Standard & Poors;[139] and

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135 Contact Energy [PUBLIC] "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), p.10.

136 Contact Energy [PUBLIC] "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), p.10.

137 Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 40-44.

138 Transpower's attachment to their submission on the cost of capital update paper "Trailing average cost of debt and efficient debt management" (5 February 2016), p.28.

139 Houston Kemp "Comment on the Commerce Commission's cost of capital update paper" (report prepared for Powerco, 5 February 2016), p.14.

227.4 the 'new issue premium' which is a potential discount that firms may have to apply to enable them to offer new debt into the bond markets.[140]

228. The cost of debt allowance is a benchmark estimate based on the cost of issuing publicly traded corporate bonds denominated in New Zealand dollars. Actual debt practices are likely to vary significantly from supplier to supplier depending on their strategy, risk tolerance and efficiency. We do not attempt to replicate exactly all of the costs associated with an individual supplier's hedging or issuance strategy.

229. We have called this approach, which focusses on one type of debt, the 'simple' approach. An alternative, which considers each option a supplier has for raising debt (eg, issuing bank debt, or issuing bonds overseas) has been called the 'complex approach'.[141] In 2010 we rejected the use of a complex approach because a lot of the information on other forms of debt is generally not publically available, requires several subjective assumptions, and requires firm-specific data.[142]

230. Given this approach, we do not consider other types of debt (eg, bank debt, non-vanilla corporate bonds, foreign issued bonds) which may have different issuance costs.

231. As noted in 2010, firms generally borrow from banks for a term less than five years, which is likely to result in an all-in cost of debt less than a publicly traded corporate bond with five years to maturity.[143] We, therefore, consider this approach to be relatively favourable to suppliers.

232. A number of suppliers have claimed that that there are significant costs associated with the issuing of debt. We consider that a significant portion of these costs are associated with types of debt that are not publically available corporate bonds. For example, the use of standby facilities is a prudent aspect of debt management, but is generally associated with the use of shorter-term debt (eg, commercial paper). We also consider that a S%P credit rating is not necessarily required to issue New Zealand domestic bonds by New Zealand regulated suppliers.

233. Although these debt management costs may be legitimately incurred by suppliers, we do not consider that they should be included in debt issuance costs, given our simple approach to determining the cost of debt. As noted above, this simple approach can be advantageous to suppliers in other aspects.

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140 CEG "Key reforms to rate of return under the IMs" (report prepared for ENA, February 2016), para 248-249.

141 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H5.29.

142 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H5.42-H5.43.

143 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H5.42-H5.43.

234. We accept that there has been some evidence of a new issue premium in various foreign debt markets, but no specific evidence has been presented to us on the average premium in New Zealand. Any premium is likely to be variable (and can even be negative) depending on the state of the debt market at any point in time.

Evidence from submissions – swap costs

235. Contact submitted that swap execution costs are approximately 2 bps p.a. and suggested that on average the equivalent of 1.3 swaps (ie, equivalent to 2.6 bps p.a. in total) would be needed because it could be assumed that at least some of the debt would be issued using floating rates (which would only require one swap to hedge to the regulatory period) and some would be issued during the determination window (requiring no swaps).[144]

236. Aurora submitted that we should include an allowance for the cost of two swaps with an allowance for each of 4 bps p.a. (8 bps in total), based on our decision in the UCLL/UBA pricing review.[145] However it suggested that these costs should be reviewed. Houston Kemp suggest we should estimate the costs of swaps from the confidential debt survey.[146]

Review of swap costs

237. The current IMs define the cost of executing a swap transaction as:

> 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

238. Based on this definition, we estimated a swap cost of 4 bps for the UBA/UCLL FPP decision. However, this estimate was based on the observed data value from a single day.[147] Subsequent analysis of the data over a longer period (2013-2015) showed that the average swap cost over that time was 1-2 bps. This value appears to be consistent with the values used by suppliers in their disclosed TCSD calculations. Average supplier estimates for swap costs as for the TCSD calculation ranged from 0.7 bps p.a. to 3.5 bps p.a.

239. The majority of bonds in the 2016 confidential debt survey used to estimate the average issuance costs described estimated the cost of a swap transaction as 2 bps p.a.

240. We consider that the evidence suggests that an appropriate estimate of the cost of executing a swap transaction in NZ is approximately 2 bps p.a.

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144 Contact Energy [PUBLIC] "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), Appendix 6.

145 Aurora "Input methodologies review: Update paper on the cost of capital topic" (5 February 2016) p.13.

146 Houston Kemp "Comment on the Commerce Commission's cost of capital update paper" (report prepared for Powerco, 5 February 2016), p.14.

147 This date was 1 August 2014.

Amortisation of upfront costs

241. CEG submitted that upfront debt costs need to be amortised over time using a cost of capital to take into account the time value of money.[148]

242. We disagree with this conclusion because, as identified in paragraph 97, efficient suppliers typically issue some debt each year to manage refinancing risk. They therefore incur some debt issuance costs each year. Assuming that firms issue a consistent amount each year with similar costs, there is no need for a present value adjustment in respect of a portfolio of debt.

Debt issuance costs conclusion

243. Evidence from the 2010 and 2016 debt surveys, together with the consideration of the High Court suggests that the existing assumption of 0.35% p.a. for issuance costs is likely to be generous in terms of issuing NZ domestic corporate bonds. We noted this generosity in 2010.[149]

244. Information received from the 2016 debt survey and submissions suggest that these costs are more likely to be in the region of 5-10 bps p.a. for debt issued with a five-year original maturity term. Swap costs appear to be in the region of 2 bps per swap.

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

246. We consider this is sufficient to cover the costs of issuing NZ domestic corporate bonds (5-10 bps) and costs of any required swaps (~4 bps). Given the uncertainty and variability of the various costs, we consider it is prudent to include an additional margin to cover other issues related to debt issuance.

Credit rating

247. We propose to maintain S&P (or equivalent from another recognised agency) long-term credit ratings of:

247.1 BBB+ for EDBs, GPBs and Transpower; and

247.2 A- for airports.

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

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148 CEG "Key reforms to rate of return under the IMs" (report prepared for ENA, February 2016), para 243.

149 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H5.85.

249. We have specified notional long-term credit ratings, which are used when estimating the debt premium. If suppliers' actual credit ratings were used, there may be an incentive for them to increase leverage, leading to adverse implications for consumers.

250. 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's minimum long-term credit rating considered to be investment grade is BBB-.

251. Under the current IMs we use 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.[150] 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.

252. We consider that S&P long-term credit ratings of BBB+ (for EDBs, Transpower, and GPBs) and A- (for airports) remain appropriate, and note that submissions have not suggested using different notional credit ratings. In its submission on our cost of capital update paper, PwC (on behalf of 19 EDBs) stated that there is little evidence to support a change from BBB+ and suggested that "…the rationale for the choice of BBB+, remain relevant".[151]

253. We note that BBB+ is the most common long-term credit rating of the companies in our comparator sample for EDBs, Transpower and GPBs. However, Bloomberg only reports long-term credit ratings for three of the airports in our comparator sample.

254. However, it is difficult to accurately estimate the debt premium because New Zealand still only has a limited number of corporate bonds that are publicly traded. Therefore, the IM allows us to consider a wider range of credit ratings and issuers when estimating the premium.[152] This is discussed in more detail in the debt premium section.[153]

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150 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), para H5.46-H5.59; Commerce Commission "Input methodologies (airport services): Reasons paper" (December 2010), para E5.44-E5.57.

151 PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), p.12.

152 While there is a range of credit ratings held by the companies in our comparator sample for EDBs, GPBs and Transpower, more of the companies have a long-term credit rating of BBB+ than any other rating.

153 See paras 160 to 179.

Chapter 4: Cost of equity

Purpose of this chapter

255. The purpose of this chapter is to explain our draft findings on:

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

255.2 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

256. This chapter begins by explaining our draft findings in respect of asset beta, including:

256.1 how we estimated the asset beta for EBDs, GPBs, Transpower and Airports using a similar approach to 2010 and updated data; and

256.2 whether we propose to make any adjustments to asset beta for regulatory differences or differences in exposure to systematic risks.

257. We then explain our draft findings in respect of our review of the other parameters that make up the cost of equity: TAMRP and the risk-free rate.

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

Asset beta

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

259.1 maintain an asset beta of 0.34 for EDBs and Transpower;

259.2 reduce the asset beta for GPBs from 0.44 to 0.34, based on updated analysis suggesting that the 0.1 upwards adjustment to the asset beta for GPBs (that we made in 2010) should no longer be applied; and

259.3 reduce the asset beta for specified airport services to from 0.60 to 0.58, based on updated data for our revised airports comparator sample.

260. Our proposed approach to estimating asset (and equity) betas is largely unchanged from 2010. We have followed the same six-step process for estimating beta, which is summarised below.[154]

260.1 *Step 1:* identify a sample of relevant comparator firms.

260.2 *Step 2:* estimate the equity beta for each firm in the sample.

260.3 *Step 3:* de-lever each equity beta estimate to get an estimated asset beta for each firm in the sample.

260.4 *Step 4:* calculate an average asset beta for the sample.

260.5 *Step 5:* apply any adjustments for regulatory differences or differences in systematic risk across services to the average asset beta for the sample.

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

261. Although we have updated the comparator samples used and time periods considered, we have estimated very similar (unadjusted) asset betas to our 2010 decision. In reaching these estimates, we focussed on asset betas for the two most recent five-year periods (2006-2011 and 2011-2016), based on weekly and four-weekly observation frequencies.

262. We calculated weekly and four-weekly betas, averaged across each trading day, in response to submissions. This is in contrast to the weekly and monthly betas (reported by Bloomberg) that we used in 2010, which were calculated based on the last trading day of each period only. Our reasons for adopting this amended approach are discussed further in paragraphs 283 to 286 below.

263. We propose to make no adjustment to our asset beta estimates to reflect regulatory differences in New Zealand, relative to other countries in the comparator samples. This is due to a lack of empirical evidence to support making an adjustment for regulatory differences, and is consistent with our 2010 decision.

Beta measures exposure to systematic risk

264. Equity beta is a measure of exposure to systematic risk. Systematic risk measures the extent to which the returns on a company fluctuate relative to the equity returns in the stock market as a whole. For example:

264.1 if an investment had no systematic risk (ie, it showed no correlation with returns on the market), its equity beta would be zero; and

[154] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H8.14.

264.2 if an investment in the equity of a company is of average risk, the equity beta will be one. This means that the premium over the risk-free rate that equity investors expect will be the same as the average for the overall market (the TAMRP).

265. An asset beta removes the effect of the firm's capital structure, by estimating the equity beta for an unlevered (zero debt) firm. Therefore, asset beta is a measure of systematic risk that can be compared across firms, without being affected by their specific financing strategies. Under the simplified beta leveraging formula for the simplified Brennan-Lally CAPM (ie, assuming a debt beta of zero), *equity beta = asset beta/(1 - leverage)*.

266. Beta is not directly observable so we estimate it empirically. We estimate forward-looking betas because the cost of capital is intended to be forward-looking. We use historic estimates of average betas because beta is expected to be relatively stable over time and historic betas are indicative of future betas.

267. For firms with traded stocks, the beta for the firm can be estimated directly from the historical returns on those stocks, relative to the market's return. However, there are practical difficulties when reliably estimating betas; for example, Vector is the only publicly listed EDB or GPB in New Zealand. Therefore, we use a sample of international comparator firms when estimating beta.

We propose to use an asset beta of 0.34 for regulated energy businesses

268. The discussion below explains why we consider an asset beta of 0.34 should be used for EDBs, Transpower, and GPBs, based on the updated analysis we have undertaken. In reaching this view, we have followed the six-step process outlined in paragraph 260.

Identifying a sample of relevant comparator firms

269. The first step in our process is to identify relevant comparable firms for inclusion in our sample.

270. We have included New Zealand, Australian, UK, and US-based electricity and gas utilities in our comparator sample. In practice, it is difficult to find a sufficient number of comparable New Zealand based businesses in most industries, so we cannot rely solely on domestic data. Therefore, we have included firms from overseas jurisdictions to ensure our sample is sufficiently large to reach a reliable estimate.

271. This is consistent with Maui's submission on our cost of capital update paper, which recognised that there are very few publicly listed 'pure-play' GTBs even when looking overseas. Maui suggested that:[155]

> This justifies the Commission's approach to obtain beta estimates for GTBs by using a wider sample of publically listed utility companies, mostly in the USA, without making a more detailed assessment of their business portfolio composition.

272. As there are few 'pure-play' electricity lines and gas pipelines comparators available, we have included vertically integrated utilities (ie, including generation and retail) when estimating beta. We have also only included companies that had at least five years of trading data, and a market value of equity of at least US$100m. This is consistent with our approach in 2010.

273. To identify relevant comparable firms for inclusion in the sample, we used Industry Classification Benchmarks (**ICB**) reported by Bloomberg. Specifically, we used the 'Electricity', 'Gas Distribution', 'Pipelines, and 'Multiutilities' classifications when identifying firms to be included in our comparator sample. The classifications we have used differ slightly from 2010, reflecting changes in the ICBs.[156]

274. We then used Bloomberg company descriptions and 'Segment Analysis' information to assess the nature and extent of each company's business, and excluded any firms from the sample that we did not consider were sufficiently comparable. Where a parent and subsidiary company were both captured, we only included the company we considered to be most relevant.[157]

275. This resulted in a sample of 74 firms, which are listed in Attachment A. 64 of the firms in our updated sample were also included in the 2010 sample. Table 1 shows the:

    275.1 15 companies included in the 2010 sample that are not included in our new sample because of acquisitions or de-listings (in red); and

    275.2 10 new firms that have been added (in green).

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155 MDL, Untitled submission on cost of capital update paper (5 February 2016), p.2.

156 In the 2010 IMs decision we used the following classifications: 'Electric – Distribution', 'Electric – Integrated', 'Electric – Transmission', Gas - Distribution' and 'Pipelines'. Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H8.44.

157 Specifically, OKS US Equity, SEP US Equity, and WMB US Equity were excluded from the sample. OKE US Equity and SE US Equity (which are related companies of OKS US Equity and SEP US Equity, respectively), were previously included in our 2010 comparator sample, so we have retained these companies in our revised sample. We have included WPZ US Equity in our revised sample, which is a subsidiary of WMB US Equity.

Table 1: Changes in our energy asset beta comparator sample since 2010

Bloomberg ticker	Company	Reason for removal/addition
0111145D US Equity	NICOR INC	Acquired by GAS US Equity.
AYE US Equity	ALLEGHENY ENERGY INC	Acquired by FE US Equity.
CEG US Equity	CONSTELLATION ENERGY GROUP	Acquired by EXC US Equity.
CHG US Equity	CH ENERGY GROUP INC	Acquired by FTS CN Equity.
CV US Equity	CENTRAL VERMONT PUBLIC SERVI	Acquired by multiple acquirers.
DPL US Equity	DPL INC	Acquired by AES US Equity.
ENV AU Equity	AUSTRALIAN GAS NETWORKS LTD	Acquired by multiple acquirers.
HDF AU Equity	APA SUB GROUP	Acquired by APA AU Equity.
HED NZ Equity	HORIZON ENERGY DISTRIBUTION	Delisted.
NST US Equity	NSTAR LLC	Acquired by ES US Equity.
NVE US Equity	NV ENERGY INC	Acquired by BRK/A US Equity.
PGN US Equity	PARAGON OFFSHORE PLC	Ticker change: PGNPF US Equity. PGNPF no longer relevant, is an offshore drilling rig company.
TEG US Equity	INTEGRYS ENERGY GROUP INC	Acquired by WEC US Equity.
UIL US Equity	UIL HOLDINGS CORP	Acquired by IBE SM Equity.
UNS US Equity	UNS ENERGY CORP	Acquired by FTS CN Equity.
AES US Equity	AES CORP	Acquired DPL US Equity (which was in 2010 sample). Electric utilities made up approx 47% of its revenues in FY2011.
BWP US Equity	BOARDWALK PIPELINE PARTNERS	Operates approximately 14,090 miles of natural gas pipelines.
DGAS US Equity	DELTA NATURAL GAS CO INC	Regulated gas distribution accounted for approx 66% of revenues in 2015.
EEP US Equity	ENBRIDGE ENERGY PARTNERS LP	Transports, generates, and distributes energy in North America. Natural gas business accounted for approx 55% of revenues in FY2015.
JEL LN Equity	JERSEY ELECTRICITY PLC	Sole supplier of electricity in Jersey, Channel Islands. Approximately 80% of revenue came from energy in FY2015.
KMI US Equity	KINDER MORGAN INC	Owns/operates approximately 84,000 miles of pipelines in North America. Natural gas pipelines accounted for approx 60% of revenues in FY2015.
SSE LN Equity	SSE PLC	Electricity networks transmit and distribute electricity to around 3.7 million businesses. Also distributes gas to around 5.7 million homes.
STR US Equity	QUESTAR CORP	Involved in retail gas distribution, interstate gas transportation and gas production. Gas/Pipelines account for almost all its revenues.
TCP US Equity	TC PIPELINES LP	Natural gas pipelines make up all of its business (100% of revenues are from Pipeline Transportation).
WPZ US Equity	WILLIAMS PARTNERS LP	Operates long-haul natural gas transmission lines that serve utilities and power generators.

276. In its submission on our cost of capital update paper, CEG removed the same 15 companies from the 2010 sample, but did not appear to add any new companies (other than the companies that changed name).[158] This resulted in a comparator sample of 68 firms, which is very similar to our proposed sample contained in Attachment A.

277. Frontier Economics (for Transpower) suggested a new approach for excluding illiquid firms from our comparator sample. Frontier noted that our current approach of limiting the sample to companies with a market equity value of at least US$100m is:[159]

> …a blunt way of dealing with the illiquidity of potential stocks as it ignores the possibility that some small companies may be relatively deeply traded, and some large companies may be relatively thinly traded.

278. Frontier proposed using Amihud's liquidity metric, which "takes account of the volatility of the recorded stock price and the dollar volume of daily trade".[160] It acknowledged that there is no objective threshold for the liquidity test, so it devised a "subjective threshold" for excluding companies from the sample.[161] As a result, Frontier removed several firms from our 2010 sample and concluded that the average asset beta would have increased from 0.31 to 0.32.[162]

279. We agree that using market equity values as a proxy for liquidity is an imperfect test, but we value its simplicity. We consider that a different approach (such as Amihud's liquidity metric), which would still require a subjective threshold, is unlikely to produce materially different estimates of asset beta. Frontier Economics' own analysis applying Amihud's liquidity metric made no material difference to the asset beta estimate.

280. Frontier also noted that, when applying Amihud's liquidity metric, its asset betas were "…computed using Friday as the reference day and otherwise using the same estimation approach employed by the Commission in the Cost of Capital IM."[163] However, as noted in paragraph 284, Frontier also submitted that the choice of

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158 CEG "Asset beta" (report prepared for ENA, February 2016), p.34.

159 Frontier Economics "Cost of equity issues related to input methodologies review" (report prepared for Transpower, February 2016), p.49.

160 Frontier Economics "Cost of equity issues related to input methodologies review" (report prepared for Transpower, February 2016), p.49

161 Frontier Economics "Cost of equity issues related to input methodologies review" (report prepared for Transpower, February 2016), p.51.

162 We note that Frontier only conducted this exercise using weekly data. It is not clear that the same effect would be observed for monthly data, which is not always consistent with weekly estimates.

163 Frontier Economics "Cost of equity issues related to input methodologies review" (report prepared for Transpower, February 2016), p.53.

reference day can have a significant impact on the results.[164] It is not clear that the same effect would have been observed had more reference days been used.[165]

Estimating the equity beta for each firm in the sample

281. We have used a similar process as 2010 to estimate the historical equity beta for each of the individual firms in our sample. In 2010 we used weekly and monthly equity betas reported by Bloomberg, however this time we have undertaken the regression analysis ourselves. This enabled us to calculate weekly and four-weekly betas, averaged across each trading day, as explained in paragraphs 283 to 286.

282. We calculated equity beta and leverage estimates using source data (obtained from Bloomberg) on share prices, market indices, market capitalisation and net debt for each firm in the sample. The time periods and observation frequencies considered are:[166]

    282.1 the five-year period to 31 March 2001 using daily, weekly and 4-weekly observations;

    282.2 the five-year period to 31 March 2006 using daily, weekly and 4-weekly observations;

    282.3 the five-year period to 31 March 2011 using daily, weekly and 4-weekly observations; and

    282.4 the five-year period to 31 March 2016 using daily, weekly and 4-weekly observations.

283. In our 2010 decision, we used weekly and monthly equity beta estimates reported by Bloomberg. These weekly and monthly estimates were calculated based on data for the last trading day of the week or month, respectively.

284. In its submission on our cost of capital update paper, Frontier suggested that there is a "risk of estimation error due to choice of reference day" and "the allowed return could be ±0.35% merely due to the arbitrary selection of the reference day used to compute weekly returns".[167] Frontier also indicated that the risk is magnified when moving from weekly to monthly estimates.

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164 Frontier Economics "Cost of equity issues related to input methodologies review" (report prepared for Transpower, February 2016), p.45.

165 As noted in paragraphs 283 to 286, we have now estimated weekly and 4-weekly asset betas averaged across each trading day in the period.

166 We used daily equity beta estimate reported by Bloomberg. We calculated the weekly and 4-weekly beta estimates ourselves, as noted in para 281.

167 Frontier Economics "Cost of equity issues related to input methodologies review" (report prepared for Transpower, February 2016), p.45.

285. Similarly, CEG noted the risk of estimation error from using a single monthly asset beta estimate:[168]

> …the Commission's use of a single 'monthly' asset beta estimate (measured based on the return from the first to last day of each month) is likely to lead to error. This is because there are actually 20 or so different estimates of a monthly asset beta (e.g. from the 2nd of one month to the 2nd of the next etc.). These different measures can result in very different monthly betas – even when averaged across a large sample.

286. We agree that there may be a small risk of estimation error based on the choice of reference day. Therefore, we have no longer used the weekly and monthly equity betas reported by Bloomberg. Instead, we have calculated:

286.1 four-weekly equity betas, by estimating equity betas for each of the 20 possible trading/reference days and then averaging the results; and

286.2 weekly equity betas, by estimating equity betas for each of the five possible trading days/reference days and then averaging the results.

De-levering the equity beta estimates and calculating the average asset beta across the sample

287. The next step in the process is to convert the equity betas for each comparator firm (across each time period and frequency interval) into asset betas.

288. We have applied the same approach to de-levering equity betas into asset betas that we used in 2010. In 2010 we removed the effect of each firm's leverage on its equity beta by de-levering using the tax-neutral formula.

288.1 Expressed in terms of estimating an asset beta (ie, in a form suitable for de-levering an equity beta estimate), the tax-neutral formula takes the form:

$$\beta_a = \beta_e(1-L) + \beta_d L$$

where β_a is the asset beta, β_e is the equity beta, β_d is the debt beta, and L is the leverage.

288.2 Expressed in terms of estimating an equity beta (ie, in a form suitable for re-levering an asset beta estimate), the tax-neutral formula takes the form:

$$\beta_e = \beta_a + (\beta_a-\beta_d)L/(1-L)$$

289. To estimate a service-wide asset beta, we averaged the individual asset beta estimates across our comparator sample (giving each estimate equal weighting). This

[168] CEG "Asset beta" (report prepared for ENA, February 2016), para 25.

produced the results shown in Table 2. Further details regarding the results for the comparator sample are included in Attachment A.

Table 2: Summary of energy asset beta comparator sample results

	Daily asset beta	Weekly asset beta	4-Weekly asset beta	Leverage	# of firms in the sample
2011 - 2016	0.39	0.34	0.30	40%	74
2006 - 2011	0.39	0.36	0.34	42%	74
2001 - 2006	0.30	0.27	0.31	45%	69
1996 - 2001	0.16	0.10	0.07	41%	61

290. When determining the average asset beta estimate for our energy comparator sample, we have considered the weight that should be given to different observation intervals and estimation frequencies. Our view is that most weight should be given to:

290.1 the two most recent five-year periods (ie 2006-2011 and 2011-2016), for the reasons explained in paragraphs 291 to 295; and

290.2 weekly and four-weekly asset beta estimates (rather than daily estimates), for the reasons given in paragraphs 296 to 302.

291. Aswath Damodaran, a Professor of finance at the Stern School of Business at New York University, suggests that a trade-off exists when choosing a time period for beta estimation:[169]

> By going back further in time, we get the advantage of having more observations in the regression, but this could be offset by the fact that the firm itself might have changed its characteristics, in terms of business mix and leverage, over that period. Our objective is not to estimate the best beta we can over the last period but to obtain the best beta we can for the future.

292. We recognise this trade-off, and in this context we consider that the two most recent five-year periods provide an appropriate balance between the number of observations and the best reflection of beta for the future.

293. However, we note that using the two most recent five-year periods may not always provide this balance, given that asset beta estimates can vary significantly across

[169] Estimating Risk Parameters, Aswath Damodaran (http://people.stern.nyu.edu/adamodar/pdfiles/papers/beta.pdf).

periods. For example, the asset betas for the 1996-2001 period appear particularly low, consistent with our findings for 1995-2000 in the 2010 IMs reasons paper.[170]

294. In the original IMs, we first looked at the most recent five-year period in our draft decision. For the final decision, published in December 2010, we analysed a broader range of time periods, but noted that this did not materially change our original asset beta estimate (based on the most recent five-year period, as contained in the draft decision). Therefore, we maintained the unadjusted asset beta of 0.34 for EDBs, Transpower and GPBs.[171]

295. Using data from the two most recent five-year periods is consistent with the approach that we took to estimating asset beta for our recent telecommunications pricing determinations. However, in that case we gave more weight to the most recent five-year period.[172]

296. We have given equal weight to four-weekly and weekly asset beta estimates, but have not given significant weight to daily estimates. Due to the 'noisy' nature of daily betas, we consider that they should not be given significant weight when estimating our average asset beta. We also note that:

    296.1 the daily results from our energy comparator sample are higher than the weekly or four-weekly results, but are lower than the weekly or four-weekly results from our airport comparator sample (see Table 7). This suggests that the daily results are not subject to systematic bias; and

    296.2 although we have not placed significant weight on the daily results, they would not have materially changed our asset beta estimates in either case.

297. Olan Henry, a Professor of finance at Liverpool University, provided advice to the ACCC in 2009 stating that:[173]

> There is a tradeoff between the noisy nature of the daily data and the lack of degrees of freedom in the monthly data. The best compromise would appear to be the use of data sampled at the weekly frequency.

298. Regarding Professor Henry's suggestion that monthly data suffers from a lack of freedom due to having fewer estimates, we note that his comments were made

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170 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), figure H9, p 524.

171 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), paras H8.62-H8.72.

172 Commerce Commission "Cost of capital for the UCLL and UBA pricing reviews" (15 December 2015).

173 Olan Henry "Estimating beta" (2009), p.48

using sometimes "less than 30 monthly observations meaning that statistical inference is unlikely to be reliable".[174]

299. Not only do we have significantly more estimates because we have considered data from the last two five-year periods, we have also used four-weekly estimates based on data from every trading day within each period. We consider that this goes some way to addressing the issue of relying on fewer estimates when using monthly asset betas.

300. CEG submitted that we should give equal weighting to daily estimates of asset beta, stating that:[175]

> …the only reason not to give daily betas the same weight as monthly and weekly betas would be if one considered that daily betas were biased down by the above effect.

301. Professor Damodaran has also highlighted this trade-off, but appears to disagree with CEG's view that daily betas are only likely to be biased downwards. Professor Damodaran suggests that: [176]

> Betas estimated using daily or even weekly returns are likely to have a significant bias due to the non-trading problem, with illiquid firms reporting lower betas than they really should have and liquid firms reporting higher betas than is justified.

302. Similarly, in 2009 advice to Ofgem, PwC noted that "…in overall terms monthly estimates are more reliable than weekly or daily estimates…". PwC stated that:[177]

> The key points to note are as follows:
>
> - Weekly estimates suffer from the problem of different results depending upon the day of the week chosen as the basis for the regressions
> - Daily and weekly betas are less stable than monthly betas, reflecting the fact that monthly share price movements are less volatile than daily and weekly share price movements; and
> - Movements in monthly returns are more likely to be representative of underlying systematic risk than daily and weekly movements because daily and weekly returns may be influenced by short-term factors that have little to do with systematic risk — this is known as "noise" because it obscures the relationship being measured. As a result standard errors of monthly betas are lower than those for daily and weekly betas as they suffer from less noise.

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174 Olan Henry "Estimating beta" (2009), p.48.
175 CEG "Asset beta" (report prepared for ENA, February 2016), para 35.
176 Estimating Risk Parameters, Aswath Damodaran (http://people.stern.nyu.edu/adamodar/pdfiles/papers/beta.pdf).
177 PwC "Advice on the cost of Capital for DPCR5: Final Report" (Report for Ofgem, 28 July 2009).

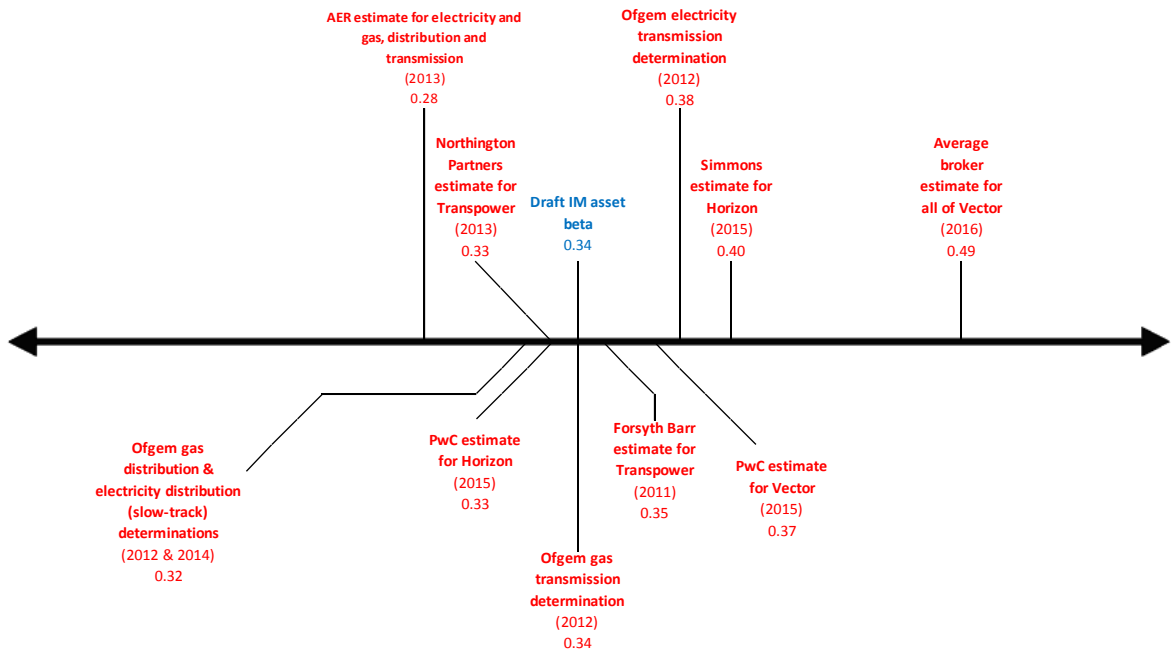
303. As a result of the above analysis, we consider that an asset beta of 0.34 is the best (unadjusted) asset beta estimate for EDBs, Transpower and GPBs. Despite updating our sample and data for the most recent period, our estimate has not moved from the 0.34 we estimated in 2010.

304. We note that CEG's asset beta analysis led to similar results to ours. Using a comparator sample similar to us, and estimating an average asset beta for the last two five-year periods, CEG's results indicate an asset beta of 0.35 (when equal weighting is given to monthly and weekly estimates for both periods, as we have done).[178]

305. CEG also estimated a 10 year asset beta, which it submitted is likely to be less volatile than the average of smaller sub-sets (eg, two five-year periods) because it includes more observations.[179] We note that CEG only finds a 0.01 difference between the 10 year asset beta and the average of the two corresponding five-year periods. When we conducted the same exercise using our updated comparator sample, the average asset beta for the 10 year period 2006-2016 was 0.35, which is also only a 0.01 difference from our estimate of 0.34.

306. We have compared our unadjusted asset beta estimate of 0.34 against a range of estimates from other sources, as shown in Figure 6.

Figure 6: Reasonableness checks on our asset beta estimate for EDBs, Transpower, and GPBs



178 CEG "Asset beta" (report prepared for ENA, February 2016), p.16.

179 CEG "Asset beta" (report prepared for ENA, February 2016), para 50.

307. Figure 6 shows that our unadjusted asset beta estimate for EDBs, Transpower and GPBs of 0.34 falls within the range of comparable information. We consider that this supports the reasonableness of our estimate.

We also considered a smaller energy comparator sample, based on Contact's submission

308. Contact submitted that a smaller sample of six comparator companies should be used to estimate the asset beta for EDBs, Transpower, and GPBs. Based on this smaller comparator sample, Contact derived an asset beta estimate of 0.19.[180]

309. The smaller sample proposed by Contact reflects its attempt to include only "genuinely comparable" companies when estimating asset beta. Contact noted that, in an ideal analysis, the set of genuinely comparable firms would include those that:[181]

    309.1 provide electricity or gas network services;

    309.2 are regulated in the same or similar regulatory environment to New Zealand;

    309.3 have the majority of their operations in similar regulated activities (eg, not electricity retailing or generation); and

    309.4 have sufficient share data to conduct a high quality beta regression analysis.

310. Based on its analysis, Contact made refinements to the full comparator sample used in the 2010 IMs decision (after assessing the scope of operations, regulatory and industry structure, and proportion of regulated revenues, for each company). This produced a primary set of six comparable companies from New Zealand, Australia and the UK, and a secondary set of seven US companies. Contact's comparator samples are shown in Table 3.

[180] Contact Energy [PUBLIC] "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), p.5.

[181] Contact Energy [PUBLIC] "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), p.4.

Table 3: Contact's asset beta comparator samples

Company name	Beta		Leverage
	Monthly	Weekly	
Primary comparator set			
Vector (NZSE:VCT)	0.28	0.25	56%
DUET Group (ASX:DUE)	0.20	0.15	73%
Spark Infrastructure (ASX:SKI)	0.19	0.20	50%
SP AusNet (ASX:AST)	0.16	0.10	46%
National Grid (LSE:NG)	0.24	0.30	48%
Envestra	0.14	0.10	71%
Mean	**0.20**	**0.18**	**57%**
Median	**0.20**	**0.18**	**53%**
Secondary comparator set			
Atmos Energy Corporation (NYSE:ATO)	0.20	0.30	49%
Eversource Energy (NYSE:ES)	0.20	0.20	52%
ITC Holdings Corp. (NYSE:ITC)	0.48	0.49	45%
Northwest Natural Gas Company (NYSE:NWN)	0.15	0.27	37%
Pepco Holdings, Inc. (NYSE:POM)	0.26	0.39	55%
The Laclede Group, Inc. (NYSE:LG)	0.15	0.33	41%
Unitil Corp. (NYSE:UTL)	0.19	0.16	55%
Mean	**0.23**	**0.31**	**48%**
Median	**0.20**	**0.30**	**49%**

311. Although Contact acknowledged that the smaller sample may increase the risk of statistical error, it argued that the improved confidence in the comparator data will far outweigh this. Contact highlighted several concerns regarding the larger comparator sample from the 2010 IMs:[182]

311.1 it is very heavily weighted to the US, a market with a very different industry and regulatory structure to New Zealand;

311.2 for many of the firms, regulated electricity and/or gas network services comprise only a small part of their total assets or operations; and

311.3 many of the businesses are highly diversified across a range of activities, making it difficult to determine the underlying risk profile.

312. In support of its proposed approach, Contact noted that the AER uses a small, closely comparable, set of nine companies when estimating beta. Contact referred to the AER's October 2015 preliminary Jemena distribution decision.[183]

313. However, we note that the AER adopted a point estimate for the equity beta of 0.7, despite the comparator sample evidence suggesting a "best empirical equity beta

[182] Contact Energy [PUBLIC] "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), p.4 and p.6.

[183] AER "Preliminary Decision: Jemena distribution determination 2016 to 2020, Attachment 3 – Rate of Return" (October 2015).

estimate of approximately 0.5"[184] The AER referred to empirical estimates from international energy networks, and the theoretical principles underpinning the Black CAPM, as additional information considered when determining an equity beta of 0.7.

314. We agree that in an ideal world, all of the companies included in our asset beta sample would be close comparators to the regulated electricity and gas network businesses in New Zealand.

315. However, we consider that Contact's sample of six comparator firms is too small to be relied on when estimating asset beta. Given the level of noise in empirical asset beta estimates, our view is that a larger sample is required to reduce the risk of measurement error. Further:

    315.1 it is not clear how Contact determined which companies to include in its primary sample of six companies (or its secondary sample of seven US companies);[185] and

    315.2 Contact's asset beta estimate of 0.19 is significant below the range of comparative information included in Figure 6 above.

316. Although in principle we consider that Contact's attempt to determine a smaller, more comparable sample, has some merit, our view is that US companies should be retained, to help increase the sample size.

317. In light of Contact's submission, we attempted to refine our updated asset beta sample for EDBs, Transpower, and GPBs, by excluding companies that are involved in generation or retailing (based on Bloomberg company descriptions). Our approach resulted in a sample of 13 companies, as shown in Table 4.

[184] AER "Preliminary Decision: Jemena distribution determination 2016 to 2020, Attachment 3 – Rate of Return" (October 2015).

[185] Although Contact considered a range of characteristics (eg, country of origin, percentage of regulated revenues, whether the company has an electricity or gas network), the thresholds used to determine whether each company should be included in the sample were not explicit. For example, Contact does not state the percentage of regulated revenues required for a firm to be included in its comparator sample.

Table 4: Asset beta comparator sample, excluding generation and/or retail companies

Company	2006-2011		2011-2016	
	4-weekly asset beta	Weekly asset beta	4-weekly asset beta	Weekly asset beta
APA Group	0.25	0.21	0.33	0.32
AusNet Services	0.09	0.09	0.27	0.25
Atmos Energy Corp	0.32	0.30	0.31	0.36
Chesapeake Utilities Corp	0.37	0.48	0.27	0.31
Duet Group	0.16	0.13	0.13	0.12
ITC Holdings Corp	0.49	0.45	0.19	0.26
Kinder Morgan Inc	-	-	0.56	0.55
National Grid PLC	0.27	0.28	0.26	0.27
Nisource Inc	0.36	0.33	0.22	0.33
ONEOK Inc	0.56	0.47	0.58	0.66
Spark Infrastructure Group	0.21	0.21	0.19	0.30
TC Pipelines LP	0.52	0.44	0.60	0.54
Vector Ltd	0.28	0.20	0.19	0.16
Mean	0.32	0.30	0.31	0.34

318. The results of this smaller sample are very similar to our full sample of 74 companies. The four-weekly and weekly estimates across the two most recent five-year periods (2006-2011 and 2011-2016) suggest an asset beta between 0.30 and 0.34, compared to our estimate of 0.34 based on the full sample.

319. Therefore, our attempt to develop a smaller, more comparable, sample suggests there is no strong evidence that a lower asset beta is appropriate.

We have not adjusted our asset beta for differences in systematic risk due to regulatory differences

320. In principle, we consider that there may be grounds for making an adjustment to our asset beta estimate to reflect regulatory differences in New Zealand, relative to other countries included in the comparator sample.[186]

321. In 2010 we acknowledged that regulatory regimes can allocate risks differently and expose regulated suppliers to different systematic risks. For example, we noted that in theory:[187]

[186] Form of control is discussed in more detail in topic paper 1. Commerce Commission "Input methodologies review draft decisions: Topic paper 1 – Form of control and RAB indexation for EDBs, GPBs and Transpower" (16 June 2016).

[187] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), paras H8.87–H8.97.

321.1 extreme forms of cost-of-service or rate of return regulation will result in the regulated supplier bearing minimal systematic risk, given that any cost increase is not borne by the supplier (and instead is immediately passed through to the consumer); and

321.2 pure forms of price cap regulation (also known as CPI-X or RPI-X regulation) will generate outcomes where the regulated supplier will bear the risk of any changes in cost/volumes, while the consumer price remains unaffected.

322. However, we were not aware of any empirical evidence that demonstrated what adjustment should be made for regulatory differences, or of any overseas regulators making an adjustment. Therefore, we decided against making any adjustment to asset beta for regulatory differences.[188]

323. Submissions on our cost of capital update paper generally agreed that we should continue to not make an adjustment to asset beta for regulatory differences. For example:

323.1 Houston Kemp (for Powerco) suggested that "…there are compelling reasons to believe that there are no material differences in systematic risk between these forms of control…";[189] and

323.2 CEG (for the ENA) noted that "it is very hard to find an effect of the form of regulation on measured asset betas".[190]

324. Following these submissions, we requested advice from Dr Lally on whether any adjustments should be made due to regulatory differences. Dr Lally disagreed with Houston Kemp's conclusion, and stated that "price caps should give rise to higher betas than revenue caps (and hybrid price/revenue caps) because prices caps expose firms to volume risk and this is at least partly systematic".[191]

188 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), paras H8.85–H8.162.

189 Houston Kemp "Comment on the Commerce Commission's cost of capital update paper" (report prepared for Powerco, 5 February 2016), p.7.

190 CEG "Asset beta" (report prepared for ENA, February 2016), p.26.

191 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016), p.10.

325. However, after reviewing a number of empirical studies, Dr Lally concluded that "there is no empirical study that provides a clear conclusion on the effect of regulation on beta".[192] Dr Lally noted that:[193]

> …the best empirical evidence on the impact of regulatory regimes on beta is that of Alexander et al (1996), which suggests that price capping yields higher betas than ROR regulation. Furthermore, as discussed above, this conclusion survives even the concerns raised by Buckland and Fraser (2001). However, the study is now 20 years old and the period examined was only five years. So, there is room for doubt about the validity of the conclusion (a possibility acknowledged even by the authors) and its application to the present time.

326. Submissions generally agreed with Dr Lally's conclusion. For example:

326.1 WELL submitted that "Dr Lally's conclusion that there is no empirical evidence to support different asset betas for different price control regimes provides further support for no adjustment to the asset beta for form of control";[194] and

326.2 Transpower submitted that "We agree with Dr Lally that while theoretically price-capped businesses may have higher asset betas than both ROR regulated and revenue-capped businesses, there is no empirical study that provides a clear conclusion on the effect of regulation on beta".[195]

327. It is difficult to discern the form of regulation that each of the companies in our comparator sample is subject to. There are many variations of economic regulation, and as many of our comparator companies operate in the US, they may be subject to different types of regulation in different States.

328. Further, given beta estimates are noisy, it would be difficult to determine whether any differences in asset beta were solely due to the differences in the form of regulation applied. We consider that this would likely be the case even if it were possible to accurately assess what form of regulation each comparator company was subject to, for what time period, and whether those forms of regulation were comparable.

329. In addition, we consider that it is not clear that differences between revenue caps and weighted average price caps have a material impact on exposure to systematic risk. This is discussed in paragraphs 365 to 369.

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192 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016), p.20.

193 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016), p.19.

194 Wellington Electricity "Input methodologies review – Commission emerging views" (24 March 2016), p.7.

195 Transpower "Asset beta adjustments and Black's SDR" (24 March 2016), p.1.

330. As a result of these difficulties, and Dr Lally's advice, we do not propose to make an adjustment to our asset beta estimate of 0.34 due to regulatory differences. Although in principle regulatory differences could potentially have an effect on asset beta, we consider that there is insufficient empirical evidence to support making an adjustment.

We have not adjusted the energy asset beta for differences in systematic risk between services

331. This section considers whether any adjustments should be made to our asset beta estimate for energy businesses of 0.34, to reflect differences in exposure to systematic risk between electricity lines and gas pipeline services.

332. As described above, our primary approach to estimating asset beta is to calculate the average of our comparator sample of 74 energy businesses. The average asset beta of our comparator sample is 0.34, which reflects an average across both electricity and gas businesses.

333. After examining the available evidence, we currently consider that there is no strong case for applying different asset betas for electricity lines and gas pipeline services. We have weighed the pros and cons of applying an asset beta uplift for GPBs and consider that, on balance, not including an uplift will better promote the s 52A purpose. Therefore, we are proposing to use the same asset beta of 0.34 for EDBs, Transpower, and GPBs.

334. This contrasts with our 2010 IMs decision, where we concluded that the asset beta for gas pipeline services was likely higher than for electricity lines services. We made an upwards adjustment of 0.1 to the asset beta for GPBs, but left the asset beta for EDBs and Transpower at the average of the comparator sample. When reaching our decision in the 2010 IMs, we weighed both theoretical evidence (which tended to support making an uplift) and other empirical evidence (which generally did not support an uplift). On balance, we decided to set an asset beta for GPBs that was 0.1 higher than for EDBs and Transpower.

335. We consider that the information available to us now does not support an uplift of 0.1 to the asset beta for GPBs. We also consider that the case for a smaller uplift (or difference in the assets betas for electricity and gas services) is weak and have decided, on balance, not to make an adjustment to reflect any such difference. The main reasons for this conclusion are summarised below.

    335.1 We applied the 0.1 uplift in 2010 after considering the available evidence, including submissions and advice from Dr Lally (provided in 2008) that GPBs may face greater systematic risk than EDBs. However, we acknowledged that the 0.1 uplift "…may be considered favourable to GPBs" based on overseas regulatory precedent, analysis of our comparator sample, and evidence of regulated equity premiums for US electricity and gas utilities.

335.2 Dr Lally no longer recommends applying a higher asset beta for GPBs, based on the more detailed analysis of customer mix that he has undertaken. His analysis of the higher proportion of gas being used by industrial/commercial customers, rather than retail customers, suggests a differential between the asset beta for electricity lines and gas pipelines which he considers is too small to justify an uplift. He also considers that the option to expand gas pipeline networks, which he previously considered supported an uplift, is not a significant consideration for businesses under formal regulation.[196]

335.3 Houston Kemp (for Powerco) submitted empirical analysis suggesting the uplift for GPBs should continue to apply. Using Houston Kemp's income elasticity of demand estimates, in the context of Dr Lally's framework for assessing the impact of differences in customer mix, suggests there may be a small difference between gas and electricity asset betas (of approximately 0.04-0.08). However, we consider that:

335.3.1 although Houston Kemp has been careful in applying "robust time-series econometric techniques", its income elasticity of demand estimates for residential and commercial gas customers appear very high (and alternative estimates differ significantly). Therefore, we consider that limited weight should be placed on them;[197]

335.3.2 there is no reliable evidence regarding whether income elasticities for New Zealand GPBs differ from those in other countries. Therefore, our asset beta estimate may already broadly reflect the systematic risks faced by GPBs without an uplift;[198]

335.3.3 simply demonstrating differences between New Zealand gas and electricity consumers may suggest that an uplift for GPBs should be accompanied by a corresponding downwards adjustment for EDBs and Transpower;[199]

335.3.4 beta reflects a broader range of factors than customer mix (and differing income elasticities between customer groups). We examine evidence for other possible influences in our more detailed discussion below; and

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196 Dr Lally notes that he erred in giving weight to growth options in his advice in 2008, where that advice related to the calculation of an asset beta for price regulation.

197 Houston Kemp also acknowledges limitations of its econometric analysis of income elasticities of demand. Houston Kemp "Asset beta for gas pipeline businesses" (report prepared for Powerco, May 2016), p.6.

198 Demonstrating differences in income elasticity for New Zealand gas consumers relative to New Zealand electricity consumers is not sufficient to support an asset beta uplift for GPBs – it is differences between New Zealand GPBs and the companies in our comparator sample that is most relevant.

199 This is explained paras 386 to 387.

335.3.5 more fundamentally, it is not clear that income elasticity of demand will have a material impact on exposure to systematic risk for New Zealand electricity lines and gas pipeline businesses (given the specific nature of the risks they are exposed to under revenue cap and weighted average price cap regulation).[200]

335.4 The updated evidence from overseas regulators we have considered continues to provide no clear support for a higher asset beta for GPBs. Overseas regulators generally use the same (or very similar) asset beta estimates for electricity lines and gas pipelines.

335.5 Empirical analysis we have undertaken using our international comparator sample shows significant variations in the difference between electricity and gas asset betas over time. We consider this is more likely to reflect measurement error than a systematic difference between gas and electricity betas.

335.6 Although GPBs may intuitively appear riskier than electricity lines businesses (given that gas is a more discretionary fuel than electricity), this appears largely due to industry-specific factors which can be mitigated through diversification (and so is not relevant to asset beta). Asset beta measures exposure to systematic risk. Systematic risk affects all investments in the market, not just a particular firm or industry.

336. Our current view is that the asset beta adjustment is not required to account for differences between the comparator sample and regulated GPBs in New Zealand. Based on the available evidence, we consider that removing the uplift would improve the accuracy of our asset beta and mid-point WACC estimates for GPBs, consistent with determining our best estimate of WACC under the IMs.

337. Further, we already recognise the possibility of estimation error through our estimate of the standard error of the WACC, and use of the 67th percentile when setting price-quality paths. We consider that applying an asset beta uplift for GPBs largely based on precedent, without other robust supporting evidence, would be likely to overcompensate suppliers of gas pipeline services.

338. However, we acknowledge that attempting to quantify differences in exposure to systematic risk between electricity lines and gas pipeline services is difficult, and has received only limited attention to date.

[200] As discussed in paras 365 to 368, under a revenue cap regulated businesses receive their revenue allowance each year, independent of changes to GDP or incomes. Under a weighted average price cap, regulated businesses are exposed to forecast risk, but it is not clear that this will be correlated with the market.

339. Therefore, we welcome additional evidence to assist us in reaching a final decision on whether a gas uplift should be applied. As explained in paragraphs 388 to 391, we particularly welcome evidence regarding:

339.1 differences in exposure to systematic risk between New Zealand GPBs and our sample of international comparator companies;

339.2 how much weight should be placed on income elasticity when estimating beta, particularly in light of the nature of the risks New Zealand electricity lines and gas pipeline businesses are exposed to under revenue cap and weighted average price cap regulation;

339.3 whether other regulators estimate differences in electricity and gas betas due to differences in income elasticity;

339.4 whether New Zealand consumers have different income elasticities of demand for gas relative to consumers in other countries in our comparator sample;

339.5 why any difference in systematic risk should result in an uplift to the gas beta only, rather a smaller uplift accompanied by a reduction in the electricity asset beta; and

339.6 whether other New Zealand analysts estimate different asset betas for electricity lines and gas pipeline businesses (and why or why not).

340. This rest of this section discusses our reasons for proposing to remove the 0.1 adjustment for GPBs in more detail, including:

340.1 why we consider it important to re-assess the evidence for a gas asset beta uplift as part of this review;

340.2 why it is unclear whether GPBs face materially greater exposure to systematic risk than EDBs and Transpower, even though gas is a more discretionary fuel;

340.3 Dr Lally's latest analysis and advice, which no longer supports using a higher asset beta for GPBs;

340.4 overseas regulatory precedent, which generally supports using the same (or a very similar) asset beta for electricity lines and gas pipelines;

340.5 analysis of electricity and gas sub-sets of our full comparator sample, which also provide no clear support for an asset beta uplift for GPBs;

340.6 the reasons why we consider that a difference in systematic risk between gas and electricity businesses might suggest we should make both an upwards asset beta adjustment for GPBs and a corresponding downwards adjustment to the asset beta for EDBs and Transpower; and

340.7 additional evidence that we would welcome from submitters, in response our views explained in this paper.

We are required to re-assess the evidence for gas asset beta uplift

341. In 2010 we applied an asset beta for GPBs that was 0.1 higher than for EDBs and Transpower, based on:[201]

341.1 evidence we had, including submissions and advice from Dr Lally (provided in 2008) recommending a 0.1 uplift for GPBs, due to differences in customer types, the nature of the product, and more valuable growth options; and

341.2 a view that gas is higher risk than electricity, given that it is a more discretionary fuel (although we did not examine this point in any detail).

342. At the time, we noted that other evidence suggested that "…the IM may be considered favourable to GPBs". In particular, we noted that:[202]

342.1 the AER and Ofgem generally used the same, or very similar, asset beta/WACC estimates for electricity and gas;

342.2 empirical estimates from our comparator sample produced an asset beta for gas companies that was lower than for electricity companies; and

342.3 NERA had noted that the regulated equity premium for US electricity utilities was identical to that for US gas utilities over 1996-2010.

343. We concluded, on balance, that "…there are good reasons in theory to consider that New Zealand GPBs face greater systematic risks than EDBs, and this justifies a higher beta, and therefore a higher WACC".[203] We also stated (emphasis added):[204]

> The Commission nevertheless accepts that in New Zealand, GPBs may face higher systematic risk than EDBs, due to the considerations highlighted in previous advice provided to the Commission by Dr Lally (and summarised above) in relation to the differences between New Zealand GPBs and EDBs. **At present, there is no evidence in New Zealand to suggest that this situation has changed**. Therefore, the Commission considers that it is appropriate to apply the upward adjustment of 0.1 used in past decisions to the asset beta estimate, after any other adjustments have been made.

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201 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), paras H8.167-H8.179.

202 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), paras H13.71-H13.74.

203 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H13.74.

204 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H8.179.

344. Powerco has submitted that removing the gas adjustment would be inconsistent with the section 52R purpose of the IMs, our framework for undertaking this review, and the long-term benefit of consumers, noting that:[205]

> Predictability and certainty in regulatory arrangements incentivise investment and reward long-term planning, both of which are of critical importance to consumers.
>
> When considering whether or not to pursue an amendment to the IMs, the Commission should therefore bear in mind that the objectives of the Act may be best served by maintaining the status quo. The rationale for implementing a change to the IMs must be weighed against the inherent value of maintaining stability, and sending a signal that the IMs should not be changed lightly.

345. Similarly, First State Investments submitted:[206]

> The approach to parameters that are used to set the cost of capital warrant particular stability. Changes in approach directly affect value, so have a large impact on investment incentives. Any decision to reduce the asset beta that applies to gas pipelines would have a strongly negative impact on incentives to invest. It would certainly affect FSI's perception of investment risk in other regulated assets in New Zealand.

346. We note the following points, which are also articulated in the framework paper, in response to the submissions from Powerco and First State Investments.[207]

346.1 The s 52R purpose of IMs is not to promote certainty simpliciter, but to promote certainty in the rules which will be applied throughout the subsequent regulatory periods. If the promotion of s 52A requires an amendment to the GPB asset beta, s 52R does not constrain this.

346.2 Section 52Y(1) of the Act requires us to "review *each input methodology* no later than 7 years after its date of publication", and as such seven years is the maximum amount of certainty as to the rules the regime provides. Further, we identified in our June 2015 problem definition paper that we would be re-evaluating key WACC parameters (including asset beta), based on more recent data, to ensure they remain fit for purpose.[208] Our November 2015 cost of capital update paper noted that we intended to "evaluate evidence on the rationale" for the upward adjustment to the asset beta for GPBs.[209]

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205 Powerco "Submission on input methodologies review: Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule" (24 March 2016), paras 21-28.

206 First State Investments "Comments on Professor Lally's review of WACC issues" (24 March 2016), p 4.

207 Commerce Commission "Input methodologies review draft decisions: Framework for the IM review" (16 June 2016).

208 Commerce Commission "Input methodologies review invitation to contribute to problem definition" (16 June 2015), para 253.

209 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), para 2.14.

346.3 Changing an IM may affect conditional regulatory predictability which may, in turn affect incentives to invest. The effect on incentives to invest, to the extent it impacts on the long-term benefit of consumers, is a factor we weigh, alongside the impact on other s 52A outcomes, when considering the pros and cons of changing an IM.

347. We acknowledge the importance of stability and predictability in regulatory settings, particularly for material components such as WACC. However, we are not persuaded that the 0.1 asset beta uplift for GPBs has such status that it should not be re-assessed in this review. We consider that:

347.1 We are obliged as part of this s 52Y review to re-assess the evidence and rationale for applying an asset beta uplift for GPBs. Re-assessing the case for an uplift is particularly important, given the evidence was mixed in 2010. As noted in paragraph 342, there was evidence suggesting our approach may be considered favourable to GPBs.

347.2 Given this is a 7-year review, it is important to avoid 'locking in' a value that is too high (or too low) for, potentially, another two five-year regulatory periods.

347.3 Reaching our best estimate of each of the WACC parameters (including asset beta), will help ensure the objectives in the Part 4 purpose statement (s 52A(1)(a) to (d)) are balanced appropriately.[210] This will provide firms an expectation of earning a normal return, consistent with FCM.

347.4 Retaining the 0.1 uplift for GPBs, without sufficient supporting evidence, would conflict with the more fundamental precedent of aiming to determine our best estimate of WACC under the IMs.

348. Further, we explicitly recognise the potential for estimation error (given the uncertainty in estimating WACC) by using the 67th percentile WACC for price-quality path regulation. The practical effect of this approach is to implicitly adopt an asset beta, and a WACC, that is higher than our best estimate. We consider that setting an asset beta that is above our best estimate, combined with the 67th percentile, would overestimate WACC by more than can be justified in terms of net benefits to consumers.[211]

349. We also note that the 0.1 asset beta uplift for GPBs is not a standalone component of beta. Rather, it resulted from applying our six-step process, as outlined in

[210] As discussed in Chapter 2.

[211] Our reasons for using the 67th percentile WACC estimate for price-quality path regulation are explained in our 2014 decision on this topic. Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services - Reasons paper" (30 October 2014).

paragraph 260. The 0.1 uplift was introduced as we considered that GPBs may face significantly different exposure to systematic risk than the average of our sample of comparator companies.

350. As part of this review we have retaken each step of the six stage process for estimating beta – including reconsidering whether adjustments are required to address differences between the characteristics of the comparator companies and the services we regulate under Part 4 of the Commerce Act.[212,213]

Although gas is a discretionary fuel, this does not necessarily suggest greater exposure to systematic risk

351. Our 2010 IMs reasons paper implied that a higher price elasticity of demand for gas (relative to electricity) was one of our reasons for using a higher asset beta for GPBs. In particular, we noted that:[214]

> GPBs do have substitutes for their services and their services are not as essential to most users as electricity is. Accordingly the cost of equity for GPBs is likely to be more affected by market-wide factors than for EDBs and Transpower, but still below the market average.

352. We continue to acknowledge that there is greater discretion for consumers when deciding whether to use gas. In particular, we agree that for most consumers the decision to purchase reticulated gas (both initially and at discrete points in time) is more discretionary than for electricity.[215] Suppliers of gas pipeline services recognise the possible loss of volumes if consumers were to switch energy demand to other fuel types.[216]

353. However, it is not clear that this suggests a higher asset beta (and therefore, a higher WACC) should apply for GPBs. In estimating asset beta we are only concerned about exposure to systematic risk, rather than non-systematic risk. Systematic risk affects all investments in a market (to greater or lesser extent), not just a particular firm or industry.

354. Some aspects of the demand risks faced by GPBs are non-systematic in nature, and can be mitigated through diversification. For example:

    354.1 If the cost to consumers of reticulated gas were to increase, this may cause some consumers to switch to alternative fuels (such as bottled gas, coal or

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212 Our six stage process is discussed in further detail in para 260.

213 As discussed in paragraphs 405 to 420, we also considered whether an adjustment is required the airports asset beta, to reflect differences between regulated airport services in New Zealand and the average asset beta for our international comparator sample.

214 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para 6.4.3.

215 Vector "Pricing Methodology for Gas Distribution Services" (effective from 1 October 2015), p.11.

216 Vector "Pricing Methodology for Gas Distribution Services" (effective from 1 October 2015); and Powerco "Gas Distribution Pricing Methodology" (24 September 2015).

electricity). In this event, the GPB would experience lower volumes.[217] The tendency of gas demand to drop in response to increases in price (and vice versa), is measured by the price elasticity of demand for gas.

354.2 However, the risk of switching to alternative fuels is non-systematic, given that it will not matter to diversified business or investor. A diversified participant will be indifferent to consumers' choice of fuel – switching from gas to an alternative fuel will carry downside risk for gas, but upside risk for the alternative fuel.

355. GPBs recognise that this diversification occurs, including by gas retailers (but less so by GPBs themselves). For example, Powerco explained in its 2015 gas distribution pricing methodology that:[218]

> For the major gas retailers in New Zealand (Nova Energy and Genesis Energy on Powerco's networks), gas represents only a relatively small portion of their retail portfolios; electricity retailing tends to be their primary focus. In addition, some gas retailers may also offer liquefied petroleum gas (LPG) services to their customers. Gas retailers are therefore able to offer their customers a range of competing energy options, while Powerco can only provide reticulated natural gas services with its gas pipelines.
>
> …energy retailers may be relatively indifferent as to the type of energy they supply to customers. A customer's decision to install natural gas appliances in an existing household will lead to a decrease in the electricity consumed by that household, and the switch may represent no net benefit to the retailer. Equally, a decision by a customer to disconnect from reticulated gas will result in an increase in that household's electricity usage or a switch to bottled gas, and again the retailer may be indifferent between these outcomes.

356. Investors can also diversify the risks associated with consumers switching between alternative fuels, by investing in companies supplying a range of services.

357. Therefore, although the availability of substitutes may suggest a higher price elasticity of demand for gas, this will not necessarily lead to a higher beta. Although there is a risk to the volume of gas transported by gas pipelines, this risk can be mitigated through diversification.[219]

358. Other factors may also influence consumers' decisions regarding whether to join or leave a GPB network, for example, weather conditions or the introduction of new technologies.[220] Regarding new technologies, CEG submitted that it "would expect the higher competitive stranding risk facing gas transport businesses (relative to

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217 Vector "Pricing Methodology for Gas Distribution Services" (effective from 1 October 2015), p.11-12.

218 Powerco "Gas Distribution Pricing Methodology" (24 September 2015), p.22.

219 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016), p.8.

220 Powerco "Gas Distribution Pricing Methodology" (24 September 2015), p.21.

electricity transport businesses) to have a systematic component that would be appropriately reflected in a higher allowed asset beta".[221]

359. However, we note that:

359.1 weather events are typically a non-systematic factor that investors would not expect to be compensated for through a higher beta; and

359.2 the AER recently concluded that "[w]e do not consider the risk arising from disruptive technologies can be reasonably classified as systematic risk".[222] We agree that stranding risk is generally non-systematic in nature. The risk of competitive stranding associated with technological developments such as solar PV panels and battery storage is largely specific to the energy industry (rather than the entire market).[223]

360. On the other hand, there are aspects of consumers' choices regarding whether to purchase reticulated gas which may be affected by market-wide (systematic) factors. For example, GPBs may face greater exposure to systematic risk if the income elasticity of demand for gas is higher than for electricity.

361. The tendency of consumers to change the quantity of gas demanded in response to changes in their income, which is measured by the income elasticity of demand, is relevant to systematic risk.[224] Market-wide factors (for example, an economic shock) may affect consumers' aggregate income, and as a result their demand for reticulated gas (along with other goods and services).

362. We consider reticulated gas may well have a higher income elasticity of demand than electricity in New Zealand. As Powerco explains in its 2015 gas pricing methodology, electricity is an essential service for which there are few alternatives for most consumer applications. Reticulated gas, on the other hand, is a more discretionary fuel, given consumers have a range of choices for their fuel needs.[225]

363. For example, in an economic downturn New Zealand consumers' may reduce their use of gas proportionately more than they reduce their use of electricity. However:

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221 CEG "Relative risk of gas transport services" (report prepared for Vector, March 2016), p.1.

222 AER "Final decision – SA Power Networks determination 2015−16 to 2019−20, Attachment 3 − Rate of return" (October 2015), D.1.4.

223 The possibility of asset stranding for GPBs is discussed further in the emerging technologies topic paper. Commerce Commission "Input methodologies review draft decisions: Topic paper 3 – The future impact of emerging technologies in the energy sector" (16 June 2016). We welcome further evidence on this issue.

224 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016), p.8; and Houston Kemp "Asset beta for gas pipeline businesses" (report prepared for Powerco, May 2016), p.5.

225 Powerco "Gas Distribution Pricing Methodology" (24 September 2015), p.19-20.

363.1 we are not aware of any reliable evidence on differences in income elasticities of demand for gas and electricity services in New Zealand;[226]

363.2 the impact of differences in income elasticities between gas and electricity on a regulated supplier's returns is affected by a number of other factors including consumer mix, and the composition of charges (proportion of fixed and variable charges); and

363.3 several factors beyond the income elasticity of demand affect beta. It is not clear how much weight should be given to differences in income elasticity when estimating beta, as opposed to those other factors.

364. Importantly, we have estimated asset beta by reference to a large selection of comparator companies which includes both gas pipeline and electricity lines networks. The asset beta estimates for these companies will reflect, among other things, consumers' income elasticity of demand for these services. It is only if the income elasticity of demand for New Zealand reticulated gas is significantly different to the comparator companies (such that it materially affects beta), that we should provide an uplift to our estimate of asset beta (0.34).

365. More fundamentally, it is not clear income elasticity of demand will have a material impact on exposure to systematic risk for New Zealand electricity lines and gas pipeline businesses. This reflects the specific nature of the risks that regulated businesses are exposed to under revenue caps and weighted average price caps, respectively.

366. Under a revenue cap, regulated businesses receive their revenue allowance each year, independent of changes to GDP or incomes. For example:

366.1 gas may have a higher income elasticity of demand than electricity, so that as incomes increase the quantity of gas demanded increases by more than the quantity of electricity;

366.2 under a revenue cap, this will not translate into higher revenues for the regulated business. The regulated business will need to reduce the price for the service as demand increases, to remain within the revenue cap; and

366.3 although there will be a correlation between quantity demanded and market returns, there will not be a correlation between the regulated business' revenue and market returns.

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[226] The income elasticity of demand for gas is discussed further in the context of Houston Kemp's submission (see paragraphs 373 to 374). In summary, although Houston Kemp has been careful to address data limitations when undertaking its econometric analysis, we consider the resulting income elasticity of demand estimates appear very high. We also note that they differ significantly from other available estimates.

367. Under a weighted average price cap, regulated businesses are exposed to forecast risk, but it is not clear that this will affect its exposure to systematic risk. A business' returns will be higher or lower depending on how actual demand compares to our forecast of demand, rather than necessarily being correlated to the market returns. For example:

367.1 if actual demand equals the regulator's forecast, the regulated business earns a normal return irrespective of whether the market returns have increased or decreased; and

367.2 if actual demand is greater than the regulator's forecast, the regulated business will earn an above normal return. However, this will be the case regardless of whether the regulator forecast an increase or decrease in demand. If the regulator forecast a decrease in demand, but the outcome was a smaller decrease, then the regulated business will earn above normal returns, even though the market returns would have decreased.

368. In its February 2016 submission, Houston Kemp concluded that "…there are compelling reasons to believe that there are no material differences in systematic risk between these forms of control".[227] This conclusion was based on similar analysis to paragraph 367. Specifically, Houston Kemp submitted:[228]

> …there is no reason to expect that the risk of error in forecasting the various quantity dimensions (ie, customer connection, capacity and volumes distributed) of electricity and gas distribution services – irrespective of their sensitivity to macroeconomic cycles – over a five year period has systematic properties. For this to be the case, it would need to be established that regulatory forecasts – as the basis on which forward-looking allowed revenues were set – systematically under-estimated demand in macro-economic up cycles, and over-estimated demand in down cycles. In our experience, wider industry-specific trends – such as the uptake of demand-side or energy efficiency measures, and the rates of penetration of domestic gas connections – are likely to be much more important sources of forecast uncertainty.

369. Overall, it is not clear that GPBs should receive a higher asset beta than electricity lines, simply because gas is a more discretionary fuel. This is because it is only systematic risk that is relevant to beta. It is not immediately clear whether:

369.1 New Zealand GPBs face greater exposure to systematic risk than New Zealand electricity lines businesses;

369.2 New Zealand GPBs face greater exposure to systematic risk than our sample of comparator companies; and

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227 Houston Kemp "Comment on the Commerce Commission's cost of capital update paper" (report prepared for Powerco, 5 February 2016), p.7.

228 Houston Kemp "Comment on the Commerce Commission's cost of capital update paper" (report prepared for Powerco, 5 February 2016), p.7.

369.3 income elasticity of demand will have a material impact on exposure to systematic risk, given the specific nature of the risks New Zealand electricity lines and gas pipeline businesses are exposed to under revenue cap and weighted average price cap regulation.

Dr Lally's latest advice no longer supports using a higher asset beta for gas pipeline businesses

370. As part of this review, we asked Dr Lally to consider whether the 0.1 upwards adjustment to the asset beta for GPBs continues to be appropriate. As set out in his advice, Dr Lally no longer considers that the 0.1 upwards adjustment to the asset beta for GPBs is warranted.[229]

371. Dr Lally had previously considered that, compared to electricity businesses, gas businesses had greater options to expand their networks and that this would support a higher beta for gas businesses. He now notes that the value of expansion options is relatively insignificant for businesses that are regulated, reducing the relevance of this argument.[230]

372. Dr Lally also concluded, based on his empirical analysis, that differences in customer mix do not warrant a higher beta for GPBs.

372.1 Dr Lally's May 2016 advice was based on analysis using revenue weightings and income elasticity of demand estimates for residential and commercial customers (in response to a submission from Houston Kemp). This led to him estimating an asset beta for gas than was 0.08 higher than for electricity (assuming 'theta' of 0.5), or 0.04 higher (assuming 'theta' of 0.25).[231] 'Theta' captures the extent to which income elasticity explains changes in asset beta.

372.2 However, Dr Lally also noted betas are affected by many other factors.[232] In particular, he advised that "…it is impossible to reliably estimate the

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229 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016); and Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016).

230 Dr Lally notes that he was in error in not taking this into account in his earlier advice on the appropriate asset beta for regulated gas businesses. Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016), p.3.

231 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.51-52.

232 In advice on the asset beta for the Gas Control Inquiry and Gas Authorisation, Dr Lally outlined several factors that would influence the level of systematic risk—the nature of the product or service; nature of customers; pricing structure; duration of contract prices with suppliers and customers; presence of regulation; degree of monopoly power; presence of growth options; operating leverage; and market weight of the industry on the market proxy. Martin Lally "The weighted average cost of capital for gas pipeline businesses" (28 October 2008), section 5.1, p.49-53.

difference in the betas of gas and electricity businesses purely on the basis of the two factors considered by HK, and the effect of these two factors will be significantly diluted by other factors".[233]

372.3 We note that while other factors would dilute the effect of customer mix on consumers, the analysis by Dr Lally and Houston Kemp would in theory suggest a small difference between the electricity and gas betas. However, as discussed below, we have some additional concerns about Houston Kemp's analysis which further calls into question the magnitude of the estimated difference.

373. Dr Lally's May 2016 advice relies on Houston Kemp's income elasticity of demand estimates. However, although Houston Kemp notes that it has "applied robust time-series econometric techniques" when estimating income elasticities, we consider that the values it reports appear very high.[234] In particular:

373.1 Houston Kemp estimated income elasticities of demand of 3.6-3.8 for residential gas, and 1.4-1.2 for commercial gas. These values seem very high for a service that is likely to be more of a necessity than a luxury. An income elasticity for residential gas of 3.6-3.8 implies that a 10% increase in income would lead to a 36-38% increase in quantity demanded.

373.2 Alternative studies estimate much lower income elasticities of demand for energy.[235] For example, a 2004 study of energy demand elasticities for OECD countries found the short-run and long-run income elasticities shown in Table 5.[236] This study was referenced in the March 2016 submission from First State Investments.[237]

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233 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.54-55.

234 Houston Kemp "Asset beta for gas pipeline businesses" (report prepared for Powerco, May 2016), p 6.

235 Beierlein, Dunn, and McConnon "The demand for electricity and natural gas in the northeastern United States" The Review of Economics and Statistics, Vol. 63, No. 3 (Aug., 1981), p.403-408; Mohammed A. Al-Sahlawi "The Demand for Natural Gas: A Survey of Price and Income Elasticities" The Energy Journal, Vol. 10, No. 1 (January 1989); Ronald Bernstein and Reinhard Madlener "Residential Natural Gas Demand Elasticities in OECD Countries: An ARDL Bounds Testing Approach" (October 2011); and NERA "An Econometric Assessment of Electricity Demand in the United States Using Panel Data and the Impact of Retail Competition on Prices" (9 June 2015).

236 Gang Liu "Estimating Energy Demand Elasticities for OECD Countries - A Dynamic Panel Data Approach" (March 2004), p.12. This study was referenced in the March 2016 submission from First State Investments: First State Investments "Comments on Professor Lally's review of WACC issues" (24 March 2016), p.10.

237 First State Investments "Comments on Professor Lally's review of WACC issues" (24 March 2016), table 4.1, p.10.

Table 5: Income elasticities of demand for electricity and natural gas

	Residential sector		Industrial sector	
	Short-run	**Long-run**	**Short-run**	**Long-run**
Electricity	0.058	0.303	0.300	1.035
Natural gas	0.137	0.490	0.376	1.363

373.3 Houston Kemp also reports a higher income elasticity for residential gas consumers than commercial gas consumers, but other empirical studies suggest the reverse.[238] Further, Houston Kemp reports lower income elasticities for residential electricity consumers than commercial electricity consumers – the opposite to its findings for gas. It is not clear why the income elasticities for gas and electricity would be sufficiently different to change the relative positions of each energy source.

374. We note that Houston Kemp was careful to acknowledge some of the limitations of its analysis regarding income elasticity of demand. Houston Kemp used quarterly New Zealand data for consumption and prices of electricity and natural gas services, as well as annual and quarterly data on GDP per capita (which it used as a proxy for income). However, it noted that "there are difficulties with performing analysis with these data", including:[239]

374.1 the relative lack of availability of some consumption data on a quarterly basis; and

374.2 the length of the time series for annual data, which are only available consistently since 1991.

Overseas regulatory precedent continues to suggest no uplift should be applied

375. Overseas regulatory decisions continue to provide no clear support for applying a higher asset beta for gas pipeline services, relative to electricity lines services. Specifically, we note that:

375.1 the AER and Ofgem use the same, or very similar, asset betas for electricity and gas; and

375.2 the Council of European Energy Regulators (CEER) report referred to in submissions from NERA and CEG found that gas and electricity betas determined by European regulators are generally very similar.

376. The AER's December 2013 rate of return guideline proposes the same equity beta estimate of 0.7 for electricity transmission, electricity distribution, gas transmission,

238 For example, see the results presented in Table 5.

239 Houston Kemp "Asset beta for gas pipeline businesses" (report prepared for Powerco, May 2016), p 6.

and gas distribution.[240] When combined with the AER's proposed gearing of 60%, this implies an asset beta of 0.28. Recent AER rate of return determinations for electricity distribution, electricity transmission, and gas distribution services are consistent with this guideline.[241]

377. The explanatory statement for the AER's rate of return guideline states:[242]

> We propose to adopt the same point estimate and range for equity beta across each of the energy sectors we regulate (electricity transmission, electricity distribution, gas transmission and gas distribution). This is because our conceptual analysis suggests systematic risks are similar between the different sectors of the energy market. Further, the results of our empirical analysis are not sufficiently precise to distinguish a measurable difference between the gas and electricity sectors.

378. Similarly, in recent price control determinations, Ofgem has used the same equity beta for electricity and gas distribution, and similar equity betas for electricity and gas transmission.

    378.1 For both gas distribution (RIIO-GD1) and electricity distribution (RIIO-ED1), Ofgem used an equity beta of 0.9 and gearing of 65%.[243] This implies an asset beta of 0.32.

    378.2 For RIIO-T1, a lower equity beta was used for gas transmission than electricity transmission. Ofgem used an equity beta of 0.95 and gearing of 60% for National Grid Electricity Transmission (NGET), implying an asset beta of 0.38. An equity beta of 0.91 and gearing of 62.5% was used for National Grid Gas Transmission (NGGT), implying a lower asset beta of 0.34.[244]

379. NERA (for First State Investments) and CEG (for Vector) referred to a 2016 CEER report, which reviewed asset betas for electricity and gas from 22 recent European regulatory decisions.[245]

    379.1 Based on data for 14 of the countries in the CEER report, NERA concluded that the average asset beta for gas is 0.04 higher than for electricity.[246]

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240 AER "Better Regulation - Rate of Return Guideline" (December 2013), p 15.

241 For example, AER "Final decision - Ausgrid distribution determination 2015−16 to 2018−19, Attachment 3 – Rate of return" (April 2015); AER "Final decision - Jemena Gas Networks (NSW) Ltd Access Arrangement 2015–20, Attachment 3 − Rate of return" (June 2015); and AER "Final decision - Directlink Transmission determination 2015−16 to 2019−20, Attachment 3 – Rate of return" (April 2015).

242 AER "Better Regulation Explanatory Statement Rate of Return Guideline" (December 2013), p 83.

243 Ofgem "RIIO-GD1: Final Proposals - Finance and uncertainty supporting document" (17 December 2012); and Ofgem "Decision on our methodology for assessing the equity market return for the purpose of setting RIIO-ED1 price controls" (17 February 2014).

244 Ofgem "RIIO-T1: Final Proposals for National Grid Electricity Transmission and National Grid Gas - Finance Supporting document" (17 December 2012).

245 The CEER report presents asset betas using two formulas: the Hamada formula, which accounts for tax, and the Brealey, Myers and Allen formula, which does not.

379.2 CEG calculated the average difference between gas and electricity asset betas as a median of 0.04 (or a mean of 0.02) using the Hamada de-leveraging formula. Using the Brealey, Myers and Allen de-leveraging formula resulted in a lower difference of 0 (based on the median) or 0.01 (based on the mean).[247]

380. We note that while this European evidence suggests a zero to small positive difference between the gas and electricity betas, more than half of the European regulators in question either use the same asset beta for electricity and gas, or have a lower asset beta for gas.

381. Overall, the evidence above regarding overseas regulatory decisions is generally consistent with our findings in 2010. Specifically, we noted in the 2010 IMs reasons paper that:[248]

381.1 "the AER uses the same approach and equity beta for gas distribution companies as for electricity distribution businesses and uses WACC estimates that are very close for electricity and gas"; and

381.2 "Ofgem's estimate of the WACC for gas distribution companies is very similar to that for electricity distribution companies".

Analysis of our comparator sample does not provide clear support for an uplift

382. Incenta's March 2016 submission (for First State Investments) argues that comparator sample analysis, using a modified version of our 2010 sample, supports a 0.11-0.14 adjustment for gas.[249] However:

382.1 Incenta compares betas for *gas transmission* businesses to its full comparator sample (including both gas and electricity businesses). We consider that a clearer illustration of any difference would be achieved by comparing a set of gas firms and a set of electricity firms (rather than comparing a sub-set of gas firms to a sample comprised of both gas and electricity).[250]

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246 NERA "The beta differential between gas and electricity networks – A review of the international regulatory precedent" (report prepared for Colonial First State, 22 March 2016), p 7-8. NERA notes in its report that "[a]ll betas are reported using the Modigliani-Miller formula, aside from GB, for which the Miller formula is used, in line with the regulator's approach"

247 CEG "Relative risk of gas transport services" (report prepared for Vector, March 2016), p 7-10.

248 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H13.73.

249 Incenta "Asset beta for gas pipelines in New Zealand" (report prepared for First State Investments, March 2016), p.4.

250 Dr Lally makes the same point in his report: Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p 44-45.

382.2 Incenta only considers asset beta estimates for a single period – the five years to 30 November 2015. We consider that this is too short a period to draw any reliable conclusions.[251]

383. In response to the evidence submitted by Incenta, we have undertaken our own analysis of the empirical data. We have compared asset betas for electricity and gas sub-sets of our updated comparator sample, based on rolling five-year asset betas over the most recent 20 year period. As shown in Attachment A we have classified the 74 companies in our comparator sample as either electricity, gas or integrated based on Bloomberg company descriptions. The electricity sub-set is comprised of 16 companies, the gas sub-set is comprised of 18 companies, and the remaining 40 companies are integrated electricity and gas companies.

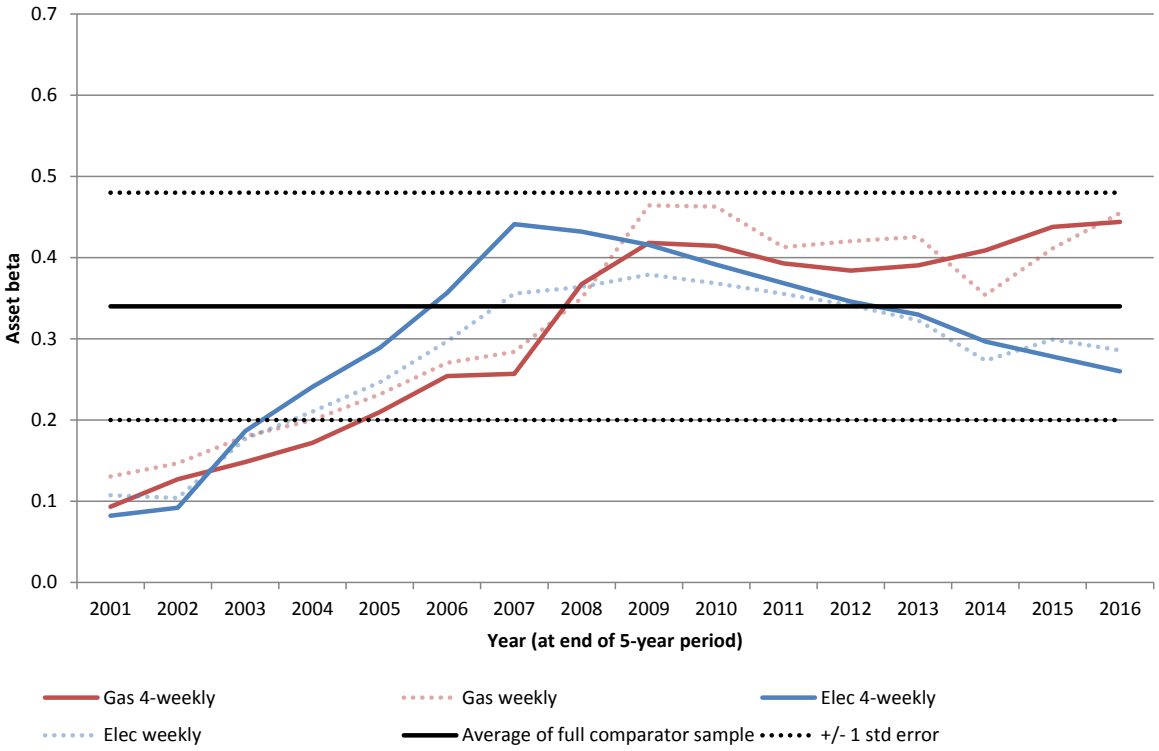
384. Although our own analysis suggests a higher asset beta for companies in recent years, this is not consistent over time. Figure 7 shows the relationship between the gas and electricity sub-sets of our comparator sample. In some periods the gas beta is higher than the electricity beta, but in other periods the electricity beta is higher than the gas beta. In our view, this suggests that:

384.1 observed differences in asset betas between electricity and gas are more likely to reflect measurement error than a systematic difference over time; and therefore

384.2 the empirical evidence in support of using a higher asset beta for GPBs is relatively weak.

[251] Note also Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.45.

Figure 7: Five-year rolling asset betas for gas and electricity sub-sets of our comparator sample



385. Figure 7 also illustrates the uncertainty associated with attempting to make an adjustment to the asset beta for GPBs. In particular, we note that a 0.1 adjustment for GPBs would be less than our estimate of the standard error of the asset beta for the full comparator sample, which is 0.14.

If an asset beta uplift was applied for gas pipeline businesses, this may suggest a downwards adjustment for electricity distribution businesses and Transpower

386. We consider that if an upwards adjustment were to be made to the asset beta for GPBs, this may (in principle) suggest a corresponding downwards adjustment should be made to the asset beta for EDBs and Transpower. This is because we have derived our asset beta estimate of 0.34 from a sample of both electricity and gas businesses. If our gas estimate is increased, the electricity estimate should be decreased, to ensure the weighted average remains 0.34.[252]

387. Even if it is assumed that New Zealand GPBs face greater exposure to systematic risk than New Zealand electricity lines businesses, there are several possible scenarios

[252] As noted in paragraph 383 above, we consider that of the 74 companies in our comparator sample, 16 are predominantly electricity companies, 18 are predominantly gas companies, and the remaining 40 are integrated electricity and gas companies. The companies have been classified as either electricity, gas, or integrated based on our reading of the Bloomberg company descriptions.

which potentially imply different adjustments to the comparator sample estimate of 0.34.

387.1 *Scenario 1:* Gas companies, both in New Zealand and overseas, face greater exposure to systematic risk than electricity companies (and by a similar amount). In this case, a higher asset beta of gas companies is already reflected in the average beta estimate for the comparator sample. This suggests a higher asset beta for gas should be offset by a decrease in the electricity beta.[253]

387.2 *Scenario 2:* New Zealand electricity lines businesses face the same exposure to systematic risk (on average) as the companies in our comparator sample. This would imply that the 0.34 estimate is most appropriate for New Zealand electricity lines businesses. When estimating the asset beta for New Zealand GPBs, a higher asset beta for gas should result in an upwards adjustment to the average asset beta derived from the overseas comparator sample.

387.3 *Scenario 3:* New Zealand GPBs face the same exposure to systematic risk (on average) as the companies in our comparator sample. This would imply that the 0.34 estimate is most appropriate for New Zealand GPBs. When estimating the asset beta for EDBs and Transpower, a higher asset beta for gas should result in a downwards adjustment to the to the average asset beta derived from the overseas comparator sample.

387.4 *Scenario 4:* The overseas gas and electricity companies in our comparator sample face higher exposure to systematic risk than New Zealand electricity lines and gas pipeline businesses. This would suggest the average asset beta of the comparator set is too high, and a downward adjustment should apply for EDBs, Transpower, and GPBs. Conversely, the overseas gas and electricity companies in our comparator sample could face lower exposure to systematic risk, implying an upward adjustment to the asset beta for EDBs, Tranpower, and GPBs.

We welcome additional evidence to assist us in reaching a final decision

388. On balance, we propose to use an asset beta of 0.34 for EDBs, Transpower and GPBs. In light of the available evidence, we consider that our original rationale for applying a higher asset beta for GPBs has been significantly weakened, and there is currently no strong evidence in support of an uplift for GPBs. Therefore, we consider that removing the uplift will best promote the long-term interests of consumers consistent with s 52A.

[253] However, if this was the case, we would also expect to see a material difference in other regulators' asset beta estimates for electricity and gas businesses.

389. However, we acknowledge that attempting to quantify differences in exposure to systematic risk between electricity lines and gas pipeline services is difficult, and has received only limited attention to date.

390. Therefore, we welcome further evidence to assist us in reaching a final decision. In particular, we are interested in evidence on the following points.

390.1 *Evidence of differences in exposure to systematic risk between New Zealand GPBs and our sample of international comparator companies.* As noted in the scenarios in paragraph 387, we consider that demonstrating a difference in risk between New Zealand electricity lines and gas pipeline businesses is not sufficient to justify an uplift to the asset beta for GPBs – it could equally suggest that there should be a downwards adjustment to the asset beta for EDBs and Transpower. Therefore, we are particularly interested in evidence of differences in exposure to systematic risk between New Zealand GPBs and our international comparator sample.

390.2 *Evidence regarding how much weight should be placed on income elasticity of demand when estimating beta.* We are particularly interested in evidence regarding the relevance of income elasticity to asset beta, given the specific risks New Zealand electricity lines and gas pipeline businesses are exposed to under revenue cap and price cap regulation (as discussed in paragraphs 365 to 368).

390.3 *Evidence of other regulators estimating differences in electricity and gas betas due to differences in income elasticity.* We are not currently aware of any other regulators estimating differences in asset beta between electricity and gas explicitly to reflect differences in income elasticity of demand. We welcome evidence on this point, as it is relevant to whether there is any strong precedent for estimating different electricity and gas betas based on differences in income elasticity (and how much weight should be given to differences in income elasticity).

390.4 *Evidence of whether New Zealand consumers have different income elasticities of demand for gas, relative to consumers in other countries in our comparator sample.* As explained earlier, we have estimated asset beta by reference to a large selection of comparator companies including gas pipeline and electricity lines networks. This suggests we should only provide an uplift to our asset beta estimate (of 0.34) for GPBs if the income elasticity of demand for gas in New Zealand is significantly different to the comparator companies (such that it materially affects beta).

390.5 *Evidence of other New Zealand analysts estimating different asset betas for electricity lines and gas pipelines.* We are also not aware of any evidence that New Zealand analysts, other than ourselves, use asset beta estimates for GPBs that are higher than for EDBs and Transpower. We welcome any

evidence showing whether other analysts estimating WACC in the New Zealand context do, or do not, make such a distinction (and why or why not).

391. As outlined above, our consideration of the case for an asset beta uplift for GPBs has raised a number of issues on which we would welcome submissions. We are open to holding a workshop on whether an asset beta adjustment should apply for GPBs if, following consideration of submissions, we consider that this would be a useful addition to our process for reaching final decisions.

Re-levering the average asset beta to an equity beta

392. For the reasons explained above, we propose to use an asset beta of 0.34 for EDBs, Transpower, and GPBs. Combining this with a notional leverage estimate of 41% (as explained in paragraphs 443 to 461), results in an equity beta of 0.58.

We propose to use an asset beta of 0.58 for airports

393. We propose to use an updated asset beta of 0.58 for specified airport services, which is lower than the value of 0.60 that we determined in 2010. Our proposed asset beta of 0.58 reflects updated data for our revised airports comparator sample.

394. In reaching this view we followed the same six-step process used in 2010, as outlined in paragraph 260. This is consistent with the process used for updating our asset beta estimate for EDBs, Transpower, and GPBs, as explained above.

Identifying a sample of relevant comparator firms

395. The first step in our process is to identify relevant comparable firms for inclusion in our sample. We have followed largely the same approach to identifying the comparators for our sample as we did for the 2010 IMs.

396. To identify relevant comparable firms for inclusion in the sample, we used Bloomberg's security finder to search for firms with 'Airport' in the description. In 2010, on the other hand, we used the 'Airport Development/Maintenance' and 'Transport – Services' ICBs to identify airports for our sample – however these classifications appear to no longer exist.

397. We then used Bloomberg company descriptions and 'Segment Analysis' information to assess the nature and extent of each company's business, and excluded any firms from the sample that we did not consider were sufficiently comparable. Consistent with our 2010 decision, we have also only included companies that had at least five years of trading data, and a market value of equity of at least US$100m.

398. This resulted in a sample of 26 firms, which are listed in Attachment B. 21 of the firms in our updated sample were also included in the 2010 sample. Table 6 shows the:

    398.1 four companies from the 2010 sample that are no longer included primarily because of acquisitions or de-listings (in red); and

398.2 five new firms that have been added (in green).

Table 6: Changes in our airports asset beta comparator sample since 2010

Bloomberg ticker	Company	Reason for removal/addition
AELG SV Equity	Aerodrom Ljubljiana dd	Acquired.
AFI IM Equity	Aeroporto Di Firenze Spa	Acquired.
FGX AU Equity	Future Generation Investment	Nothing to indicate they have holdings in airport assets.
GEM IM Equity	Gemina Spa	Acquired by ATL IM Equity.
AERO SG Equity	Aerodrom Nikola Tesla AD Beogr	Operates an airport in Serbia.
GMRI IN Equity	GMR Infrastructure Ltd	Involved in operating two major Indian airports as well as other activities.
MAHB MK Equity	Malaysia Airports Holdings Bhd	Investment holding company that owns subsidiaries that run airports.
TAVHL TI Equity	TAV Havalimanlari Holding AS	Airport operator at numerous airports.
TYA IM Equity	Toscana Aeroporti SpA	Management company for two airports.

399. In its submission on our cost of capital update paper, NZAA stated that it expected us to maintain our "…existing approach of using the largest possible comparator sample of airport operators to estimate the asset beta…" noting that "…[d]oing so will provide regulatory certainty, which best gives effect to the purpose of Part 4 and the IM".[254] We consider our updated airports comparator sample is consistent with the existing approach used in the 2010 IMs.

Estimating the equity beta for each firm in the sample

400. We have followed the same approach used for EDBs, Transpower, and GPBs when estimating the equity beta for each firm in the airports comparator sample. This approach is described in paragraphs 281 to 286.

401. Specifically, we calculated equity beta and leverage estimates using source data (obtained from Bloomberg) on share prices, market indices, market capitalisation and net debt for each firm in the sample. The time periods and observation frequencies considered are:

401.1 the five-year period to 31 March 2001 using daily, weekly and 4-weekly observations;

401.2 the five-year period to 31 March 2006 using daily, weekly and 4-weekly observations;

[254] NZ Airports "Submission on additional evidence for cost of capital input methodologies" (5 February 2016), p.2.

401.3 the five-year period to 31 March 2011 using daily, weekly and 4-weekly observations; and

401.4 the five-year period to 31 March 2016 using daily, weekly and 4-weekly observations.

De-levering the equity beta estimates and calculating the average across the sample

402. We converted the equity betas for each comparator (across each time period and frequency interval) into asset betas using the same de-levering approach as the energy sample.

403. To estimate a service-wide asset beta, we averaged the individual asset beta estimates across our comparator sample (giving each estimate equal weighting). This produced the results shown in Table 7. Further details regarding the results for the comparator sample are included in Attachment B.

Table 7: Airport comparator sample asset beta results

	Daily asset beta	Weekly asset beta	4-Weekly asset beta	Leverage	# of firms in the sample
2011 - 2016	0.59	0.60	0.66	20%	26
2006 - 2011	0.60	0.57	0.69	18%	25
2001 - 2006	0.66	0.48	0.55	12%	19
1996 - 2001	0.48	0.16	0.24	17%	6

404. When determining our asset beta estimate for airports, we have given most weight to weekly and four-weekly estimates over the two most recent five-year periods (2006-2011 and 2011-2016), for the reasons explained in paragraphs 290 to 302. This results in an average asset beta for the airports comparator sample of 0.63.

Is an adjustment to the average asset beta from the comparator sample required?

405. We consider that the average asset beta from the comparator sample (0.63) is likely to overstate beta for regulated aeronautical activities, because it relates to airports' overall (multi-divisional) businesses.

406. The average of the comparator sample gives us an asset beta estimate for an airport's total operations, rather than regulated activities only.[255] This raises the question of whether an adjustment is required to generate an asset beta estimate for regulated aeronautical activities.

[255] A company's overall beta is a weighted average of the betas of all its component businesses. However, estimating betas for component businesses is complicated by the fact that there are no traded returns for individual business units.

407. When determining our asset beta estimate for specified airport services, we are interested in the level of systematic risk relevant to aeronautical activities. This is because, under Part 4 of the Commerce Act, only aeronautical activities are subject to regulation.

408. However, the firms in our comparator sample are generally not pure plays – they have a mix of regulated and unregulated activities. Unregulated services (such as retail shopping) are generally considered more risky than regulated services (such as provision of airfields), as there is greater demand uncertainty.

409. In 2010 we made a downwards adjustment of 0.05 (from 0.65 to 0.60). We considered the average asset beta for the 2010 comparator sample (0.65) to be an upper bound, as it included both regulated and unregulated activities. In deciding on a beta of 0.60, we attributed primary consideration to:[256]

    409.1 more recent beta estimates for overseas airports, adopted for regulatory purposes;

    409.2 analysis of differences in beta estimates between regulated aeronautical services relative and non-aeronautical services from the UK; and

    409.3 the extensive unregulated activities of airports, which are considered by other regulators and suppliers of airports services to have a higher asset beta.

410. We continue to consider a downwards adjustment should be made to our comparator sample estimate of 0.63, for the reasons given in 2010. In support of treating 0.63 as an upper bound, we note that data from our updated comparator sample indicates that:

    410.1 approximately 40% of revenues are from non-aeronautical activities (see Table 8); and

    410.2 asset beta decreases as the percentage of aeronautical revenues increases (see Figure 8).

411. We have used the percentage of aeronautical revenues for each company in our comparator sample, as shown in Table 8, as a proxy for the percentage of regulated revenues.[257] This shows that, on average, approximately 60% of an airport's revenues are from aeronautical activities, suggesting that a significant amount of an airport's business is likely to be unregulated.[258]

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256 Commerce Commission "Information disclosure (Airport Services) reasons paper" (22 December 2010), para E8.96.

257 The percentages of aeronautical revenues have been calculated based on Bloomberg segment analysis.

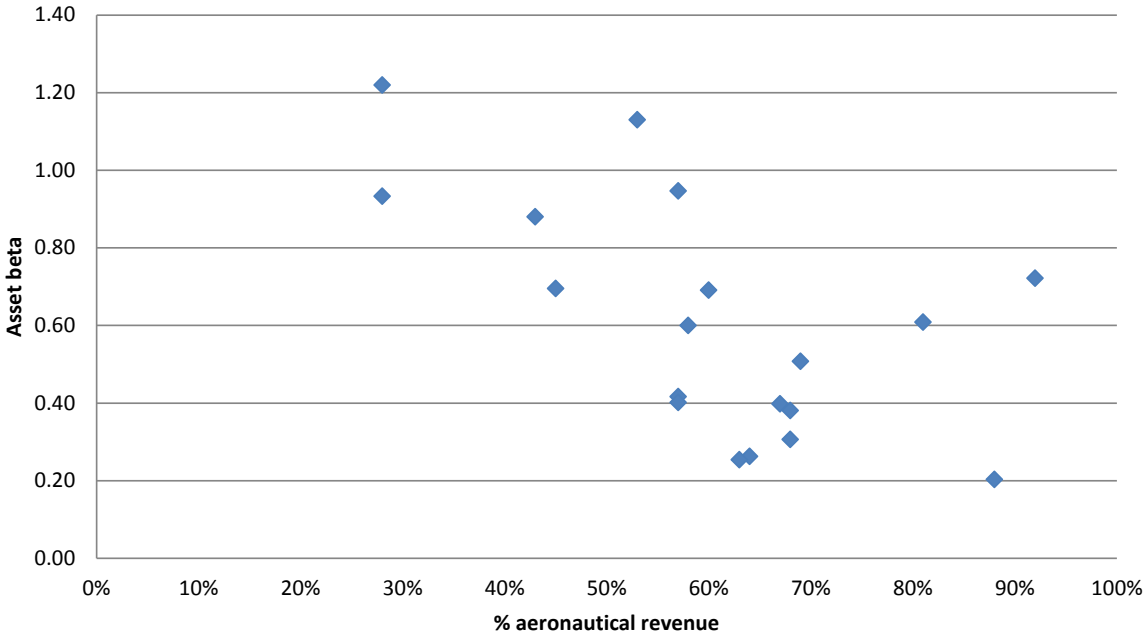
258 Given that only aeronautical activities are subject to regulation in New Zealand, we have used aeronautical revenues as a proxy for regulated revenues.

Table 8: Percentage of aeronautical revenues for airports comparator sample

Company	% of revenue from aeronautical activities
Shenzhen Airport Co	N/A
HNA Infrastructure Company Ltd	57%
Guangzhou Baiyun International	N/A
Shanghai International Airport	N/A
Xiamen International Airport C	N/A
Beijing Capital International	57%
Airport Facilities Co Ltd	N/A
Japan Airport Terminal Co Ltd	28%
Aeroports de Paris	57%
Auckland International Airport	53%
Airports of Thailand PCL	45%
Grupo Aeroportuario del Surest	28%
Flughafen Zuerich AG	60%
Flughafen Wien AG	81%
Fraport AG Frankfurt Airport S	64%
Grupo Aeroportuario del Pacifi	67%
Kobenhavns Lufthavne	58%
Malta International Airport PL	69%
Grupo Aeroportuario del Centro	68%
SAVE SpA/Tessera	N/A
Sydney Airport	43%
Aerodrom Nikola Tesla AD Beogr	92%
GMR Infrastructure Ltd	N/A
Malaysia Airports Holdings Bhd	88%
TAV Havalimanlari Holding AS	63%
Toscana Aeroporti SpA	68%
Average	**60%**

412. Figure 8 displays the relationship between asset beta and the percentage of aeronautical revenue for firms in our comparator sample. It shows that as aeronautical revenue increases, the asset beta for the airport as a whole decreases. This relationship supports our view that the average asset beta of the comparator sample (which represents the asset beta of all airport activities), should be treated as an upper bound.

Figure 8: Relationship between asset beta and percentage of aeronautical revenues for airports comparator sample



413. As part of this review, we asked Dr Lally to consider whether our 2010 adjustment from 0.65 to 0.60 is still appropriate. Based on his analysis, Dr Lally estimated a 0.03 downwards adjustment to the average asset beta of the comparator sample. However he noted that his estimate is "extremely imprecise", due to uncertainty regarding the underlying parameter values.[259]

414. In reaching his estimate of 0.03, Dr Lally:[260]

414.1 noted that the asset beta for an airport is a value-weighted average of the asset betas for its regulated and unregulated activities;

414.2 used revenue weightings as an proxy for value weightings – specifically, he assumed that the average proportion of revenues from non-aeronautical activities is 39% (based on data from six airports, included in a 2010 Europe Economics report); and

414.3 assumed that the asset beta for unregulated activities is 0.67, based on his estimate of the market average asset beta (ie, using an equity beta of one, and assuming market average leverage of 33%).

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259 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016), p.4.

260 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016), p.25-28.

415. We have considered available evidence regarding value weightings for regulated and unregulated activities at New Zealand airports, given that Dr Lally noted revenue weightings are an "imperfect proxy".

416. We consider that using value weights (rather than revenue weights) suggests a bigger downwards adjustment than the 0.03 estimated by Dr Lally is likely to be appropriate. Specifically, we note that:

    416.1 Deutsche Bank estimates that unregulated activities comprise between 78%-82% of AIAL's market value;[261]

    416.2 a 2011 PwC report estimated Queenstown Airport's non-aeronautical activities as comprising 53%-55% of its total enterprise value;[262] and

    416.3 replicating Dr Lally's analysis, but assuming 67% value weighting for unregulated activities (based on the average of AIAL and Queenstown), suggests an asset beta for regulated airport services of 0.55 (ie, an adjustment of 0.08).[263]

417. We also note that there are other factors suggesting an asset beta below 0.60 may be appropriate for regulated aeronautical services. In particular:

    417.1 Deutsche Bank reports separate equity beta estimates for AIAL's business segments (0.78 for 'AIA Group', 0.71 for 'Regulated', 0.85 for 'Dual Till', and 0.60 for 'Property').[264] De-levering assuming gearing of 35% results in an asset beta of 0.46 for AIAL's regulated business, which is 0.05 lower than the asset beta for AIAL group (0.51).

    417.2 The Civil Aviation Authority (**CAA**) has estimated asset betas of 0.50 and 0.56 for Heathrow and Gatwick, respectively, which are significantly below our comparator sample average of 0.63.[265]

    417.3 Figure 8 indicates that the asset beta for a business with 100% aeronautical revenues would likely be significantly below the sample average of 0.63.

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261 Deutsche Bank "Auckland Int. Airport – Excellent 1H16, regulatory red light" (19 February 2016), Figure 12, p.14.

262 PwC "Queenstown Lakes District Council – Issue of shares in Queenstown Airport Corporation Limited to Auckland International Airport Limited – Detailed report on fairness opinion" (15 March 2011), table 14, p.33. We have assumed that "land held for future development" and "commercial activities" capture all the non-aeronautical activities.

263 Further, assuming market average leverage of 30% (as we previously used in the 2010 IMs reasons paper), would reduce the implied regulated asset beta to 0.49 (an adjustment of 0.14). Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), paragraph H13.14.

264 Deutsche Bank "Auckland Int. Airport – Excellent 1H16, regulatory red light" (19 February 2016), p 13.

265 Civil Aviation Authority "Estimating the cost of capital: technical appendix for the economic regulation of Heathrow and Gatwick from April 2014: Notices granting the licences" (February 2014), Figure 7.1, p.44.

417.4 PwC's analysis of Queenstown Airport uses an asset beta range for commercial activities of 0.6-0.8, implying an average of 0.7.[266] This is significantly higher than the 0.6 it uses for aeronautical business, and suggests that an adjustment of 0.03 would be too small.

417.5 For the Airports Inquiry in 2002, we used an asset beta of 0.50 based on advice from Dr Lally.[267]

418. On the other hand, there are also several factors that suggest caution is appropriate.

418.1 There is uncertainty regarding differences in regulatory regimes that apply to the comparator companies (relative to NZ Airports), which may suggest caution in moving significantly away from the sample estimate of 0.63. It is unclear whether these differences affect the suppliers' exposure to systematic risk (and, if so, what way).

418.2 Dr Lally estimated a small adjustment of 0.03, noting that he has "very little confidence" in this value due to uncertainty regarding the two underlying parameter values.

418.3 NZAA submitted that there is insufficient evidence to credibly quantify any downward adjustment, so the most robust approach would be to not make any adjustment to the airport asset beta.[268]

419. In summary, although we consider there are strong reasons for adopting an asset beta for regulated airport services below 0.63, the appropriate magnitude of the downwards adjustment is unclear.

420. On balance, we propose to adopt an asset beta of 0.58 based on the evidence presented above. Given the uncertainty, we have made a downwards adjustment of 0.05, which is consistent with our 2010 decision. This is also consistent with the submission from BARNZ, which noted that the imprecision in the available estimates suggests "that there is not a good case for amending the existing 0.05 adjustment contained in the current input methodologies".[269]

421. We have assessed the reasonableness of our asset beta estimate of 0.58 based on available comparative information, as shown in Figure 9.

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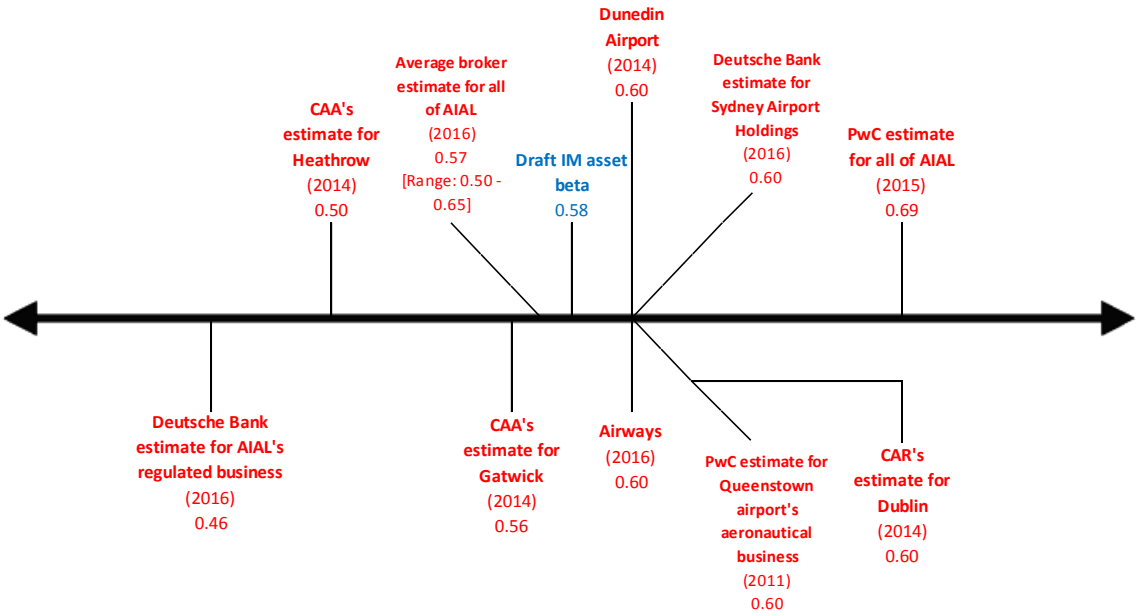
266 PwC "Queenstown Lakes District Council – Issue of shares in Queenstown Airport Corporation Limited to Auckland International Airport Limited – Detailed report on fairness opinion" (15 March 2011), p.74.

267 Commerce Commission "Final Report Part IV Inquiry into Airfield Activities at Auckland, Wellington, and Christchurch International Airports" (1 August 2002); Martin Lally "The cost of capital for the airfield activities of New Zealand's international airports" (November 2001).

268 NZ Airports "Submission on expert advice on cost of capital topics" (24 March 2016), p.1.

269 BARNZ "Professor Lally's advice on airport asset beta adjustment" (29 March 2016).

Figure 9: Reasonableness checks on our asset beta estimate for airports



422. The above diagram shows that our asset beta estimate for airport services of 0.58 falls within the range of comparable information. We consider that this supports the reasonableness of our estimate.

Re-levering the average asset beta to an equity beta

423. For the reasons explained above, we propose to use an asset beta of 0.58 for specified airport services. Combining this with a notional leverage estimate of 19% (as explained in paragraphs 443 to 461), results in an equity beta of 0.72.

Tax adjusted market risk premium

424. We propose to maintain a TAMRP of 7%, which is the figure used in the current IMs.[270] The TAMRP is a market-wide parameter, so we use a consistent approach across sectors.[271]

425. The MRP represents the additional return, over and above the risk-free rate, that investors look for to compensate them for the risk of holding a portfolio of risky assets (more precisely the market portfolio which is the average risk portfolio). Under the simplified Brennan-Lally CAPM, the MRP is adjusted for tax faced by the investor on equity returns (hence, tax adjusted MRP, or TAMRP).

270 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010).

271 As noted in paragraph 428, we most recently considered the TAMRP as part of our pricing determination for two telecommunications services.

426. The TAMRP is a forward-looking concept which cannot be directly observed. A number of approaches can be used to estimate the TAMRP. These approaches include:

426.1 studies of historic returns on shares relative to the risk-free rate;

426.2 surveys of investors that ask them to state their expected rate of return for the overall market; and

426.3 empirical estimates of the MRP from share prices and expected dividends.

427. In the 2010 IMs we estimated a TAMRP of 7% by considering a range of information sources, including both forecast and historic estimates of the TAMRP.[272] We noted that a TAMRP of 7%:

427.1 best reflected the range of evidence available, including both historical returns and expected future returns;

427.2 was considered reasonable by the Cost of Capital Expert Panel (which included Dr Lally); and

427.3 was consistent with the range of TAMRP estimates used by New Zealand market participants, including New Zealand investment banks.

428. We most recently considered the TAMRP as part of our pricing determination for two regulated telecommunications services – Chorus' UCLL and UBA services.[273] In those determinations we also used a TAMRP of 7%, after considering updated analysis from Dr Lally. Dr Lally recommended a TAMRP of 7% based on the median of five different methods, rounded to the nearest 0.5%, as shown in Table 9.[274]

Table 9: Estimates of the TAMRP with a five-year risk-free rate

	New Zealand	Other markets
Ibbotson estimate	7.1%	7.0%
Siegel estimate: version 1	5.9%	5.9%
Siegel estimate: version 2	8.0%	7.5%
DGM estimate	7.4%	9.0%
Surveys	6.8%	6.3%
Median	7.1%	7.0%

[272] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), paragraphs 6.5.4-6.5.15.

[273] Commerce Commission "Cost of capital for the UCLL and UBA pricing reviews – Final decision" (15 December 2015), p.41-47.

[274] Dr Martin Lally "Review of submissions on the risk-free rate and the TAMRP for UCLL and UBA services" 13 October 2015, table 4, p.35.

429. Submissions in response to our November 2015 IM review cost of capital update paper raised several concerns regarding our approach to estimating the TAMRP in the UCLL and UBA pricing determinations. Our November 2015 paper encouraged stakeholders to consider and comment on our final decision for UCLL and UBA, given that it is our most recent decision on how the TAMRP should be estimated.[275]

430. In particular, CEG (for the ENA) submitted that:[276]

430.1 Dr Lally's methodology risks permanently depressing the allowed cost of equity, given that the TAMRP under his approach has not increased as the risk-free rate has decreased;

430.2 Dr Lally has introduced three new methods to estimate the New Zealand MRP (Siegel version 1, Siegel version 2, and surveys);

430.3 Dr Lally changed his approach to estimating the TAMRP during the UCLL and UBA pricing determinations (between advice provided in 2014 and 2015), by excluding the value of imputation credits from the dividend growth model (**DGM**) estimate, and using the median (rather than the mean) of the survey estimates; and

430.4 of Dr Lally's five methodologies for estimating the TAMRP, the focus should be on Ibbotson, DGM and Siegel version 2 approaches. Less weight should be given to survey estimates, and no weight should be given to the Siegel version 1 estimate.

431. Frontier Economics (for Transpower) submitted that:[277]

431.1 the TAMRP should vary over time, but remains relatively static under our current method because most of the approaches considered produce estimates that move very slowly over time;

431.2 there is no economic or regulatory rationale for rounding the TAMRP estimate to the nearest 0.5%, noting that this has had entrenched the value of 7%;

431.3 different weight should be placed on different methods of estimating the TAMRP, based on their relative strengths and prevailing market conditions (in

[275] Commerce Commission "Input methodologies review – Update paper on the cost of capital topic" (30 November 2015), para 2.23-2.27.

[276] CEG "Key reforms to rate of return under the IMs" (February 2016), p.22-43.

[277] Frontier Economics "Cost of equity issues related to input methodologies review" (report prepared for Transpower, February 2016).

particular, the Siegel version 1 method should be discarded, and minimal weighting placed on survey evidence); and

431.4 the TAMRP figure should not be locked into the IMs, but instead a methodology should be specified that enables the TAMRP to be re-estimated as required (which would increase the chances of the TAMRP estimate reflecting prevailing market conditions).

432. Dr Lally considered these submissions in his most recent report and continues to recommend a TAMRP of 7%. He stated that:[278]

> …although I agree with some of the points raised in these submissions, I do not agree that the TAMRP estimate should be higher or that a different approach to estimating this parameter should be adopted. The most significant point of difference between me and both CEG and Frontier is that they favour exclusive or primary weight on the results from the DGM whilst I favour equal weighting over the results of five methodologies including the DGM. The result of equal weighting on these five methodologies will be an estimate of the TAMRP that is likely to have significantly smaller estimation errors than that from exclusive or primary weight on the DGM. A policy of exclusive or primary weight on the DGM would only be applicable if this methodology was significantly superior to all alternatives, and I do not think that this is the case.

433. Dr Lally also made the following points in response to the submissions from CEG and Frontier Economics.[279]

433.1 All the estimators are imperfect, but they all attempt to estimate the current value of the TAMRP. Therefore, the results from all estimators should continue to be considered.

433.2 Dr Lally shares Frontier Economics' view that the TAMRP has probably moved over time by more than the Commission's estimate, but he does not consider that this additional movement can be reliably estimated.

433.3 Of the three approaches to changing the weightings on estimators discussed by Frontier Economics, only one is sufficiently detailed to be assessed on its own merits. However, this approach will almost always result in a simple average across the DGM and Ibbotson estimators, so is likely to produce an inferior result (higher mean squared error) to using five equally-weighted estimators.

433.4 The TAMRP estimate based on Dr Lally's approach has increased corresponding with the recent fall in the risk-free rate, with the median rising

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278 Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.77.

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

from 6.9% in 2014 to 7.1% in 2015. However, the rounding process leaves the estimate unchanged at 7.0%.

433.5 The advantages of rounding to at least 0.5% outweigh a very small increase in the mean squared error. Rounding saves regulators from the need (and hence the cost) to estimate the TAMRP to a very high degree of precision, and this is desirable because high levels of precision in this area are spurious. Rounding also helps limit lobbying over small variations in the TAMRP estimate.

433.6 Siegel version 2 is the only new method used in Dr Lally's recent advice, and he has consistently used this approach when estimating the MRP since 2013 (in response to submissions from experts commissioned by regulated businesses in Australia).[280] When advising us on TAMRP he has consistently used the results of surveys since 2001, and Siegel version 1 since 2003.

433.7 Dr Lally excluded imputation credits from dividends when reporting the DGM estimate in his 2015 report, because this is consistent with the simplified Brennan-Lally version of the CAPM used by the Commission. CEG's inclusion of imputation credits in its DGM estimate was incorrect, and Dr Lally mistakenly overlooked this error when including it in his 2014 report.[281]

433.8 Dr Lally now uses the median of survey responses to help mitigate the potential impact of "frivolous responses or responses calculated to affect the result in a particular direction".

434. We also note that we are setting a TAMRP for the IMs, so the value we determine will apply to all WACC determinations until the next review of the IMs (in up to seven years' time). Therefore, we consider it inappropriate to give significant weight to short term movements in TAMRP, as these movements may not reflect the value expected to prevail over the period until the IMs are next reviewed.

435. Further, based on discussions with analysts, we understand that a TAMRP of 7% is generally consistent with estimates used by New Zealand investment banks. Table 10 summarises recent TAMRP estimates from investment banks, which range from 6.5% to 8%.

[280] Dr Martin Lally "Review of the AER's Methodology for the Risk-Free Rate and the Market Risk Premium" (4 March 2013).

[281] Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016), p.57.

Table 10: TAMRP estimates used by major New Zealand investment banks

Investment bank	TAMRP estimate
Craigs Investment Partners	6.5%
Macquarie	7.0%
First NZ Capital	7.0%
UBS	7.0%
Forsyth Barr	8.0%

436. We agree with Dr Lally's recommendation, and have continued to use a TAMRP estimate of 7.0% for the reasons listed below.

436.1 Given that the various approaches to estimating TAMRP produce significantly different estimates of TAMRP, and that no approach to estimating TAMRP is generally accepted as superior or free from methodological criticisms, we prefer to place weight on a wide range of estimates (as Dr Lally does), rather than preferring one approach (such as the DGM) over others.

436.2 We consider historic estimates of equity returns are useful indicators of a prevailing TAMRP, and understand that such methods are widely used by other analysts to estimate TAMRP (who continue to place weight on estimates of TAMRP derived from such approaches).

436.3 Using a range of estimates is our long-standing approach, and this approach has produced a stable and predictable estimate of TAMRP. This has advantages for investors and consumers of regulated services, and is appropriate when specifying IMs which will apply to WACC determinations for up to seven years.

437. We understand that an estimate of TAMRP of 7.0% remains generally consistent with the estimates used by New Zealand investment banks.

Risk-free rate

438. As in 2010, we propose to use the same risk-free rate for the cost of equity as that applied in the cost of debt. As described in paragraph 115, we propose to maintain the current prevailing approach to estimating the risk-free rate but, extend the determination window from one month to three months.

Chapter 5: Other WACC parameters

Purpose of this chapter

439. This chapter discusses our draft findings for the parameters that do not comfortably sit in either the cost of debt or cost of equity chapters.

Structure of this chapter

440. 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.

441. We then discuss the tax rates we propose to use in our WACC estimates.

442. Finally, we discuss our proposed approach to determining updated estimates of the standard error of the WACC.

Leverage

443. We propose maintaining our 2010 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 19% for airports.

444. 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 re-lever the asset beta into an equity beta (and vice versa). The second is to derive a WACC from the estimates of the cost of debt and the cost of equity.

The leverage anomaly

445. It is generally understood that leverage does not affect a firm's WACC in a tax-neutral environment because the cost of capital reflects the riskiness of cash flows, rather than how these are divided between equity and debt investors.

446. Interest costs are tax deductible, but dividends are not, so when corporate tax is considered, the WACC is generally understood to decline as leverage increases.[282] This is because interest costs are tax deductible to the firm, but dividends are not.

447. When personal tax is considered, some of the tax advantages of debt are reduced. The New Zealand dividend imputation credit regime allows firms to pass on to their shareholders a credit for the tax the company has already paid.

448. However, a well-known 'leverage anomaly' exists when using the simplified Brennan-Lally CAPM.[283] When the simplified Brennan-Lally CAPM is used to estimate the cost

[282] This is the context normally set out in textbooks when discussing the use of the classical CAPM to estimate the cost of equity.

of equity (in conjunction with the simplified beta leveraging formula), and the cost of debt includes a positive debt premium, the resulting WACC estimate increases with leverage.

449. This positive relationship between leverage and WACC is inconsistent with the behaviour of firms in workably competitive markets. Firms in those markets issue debt, providing debt levels are prudent, and are considered to be acting rationally when doing so.

450. In 2010 we identified two main options to overcome this anomaly: use the average leverage of the sample of comparator companies used to estimate asset beta, or use non-zero debt betas.[284] We noted that the use of non-zero debt betas is theoretically better than using notional leverage, but there are practical difficulties in accurately estimating debt betas. We also noted that most regulators do not use non-zero debt betas and that we had not used them in the past.

451. Debt beta measures a firm's systematic risk associated with borrowing, and is measured by the sensitivity of the returns on corporate debt to movements in returns on the market portfolio of all assets. In 2010 PwC submitted that:[285]

> If debt betas are to be excluded from the WACC analysis (which we concur with), then to be consistent the notional leverage used in the WACC estimation should be close to the average leverage of the comparator companies used to derive the (average) beta estimate. This is a fundamental requirement in order to be able to justify application of a "short cut" approach and thus ignore debt betas.

452. We recognise that the greater the riskiness of debt, the more it resembles equity. Therefore, the greater the systematic risk of debt due to market conditions, the greater is the debt beta.

453. Consequently, in principle, debt betas should be included in the cost of capital calculation. The use of non-zero debt betas is theoretically sounder than using

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283 For further discussion see: Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) Reasons paper" (December 2010), paras 6.6.1-6.6.16, and Appendix H3.

284 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), paras H3.20-H3.64.

285 Electricity Networks Association "Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers", Attachment: PricewaterhouseCoopers "Submission on the Cost of Capital parameter estimates in the Commerce Commission's Draft Electricity Distribution Services Input Methodology Determination: a report prepared for Electricity Networks Association" 13 August 2010, p.8; Telecom Limited "Submission on the Draft Input Methodologies Cost of Capital (Electricity Distribution Businesses and Gas Pipeline Businesses) Determinations and Draft Reasons Papers", Attachment: PricewaterhouseCoopers "Submission on Cost of Capital Material In the Commerce Commission's Draft Input Methodologies Determination and Reasons Paper: a report prepared for Telecom New Zealand Limited" 13 August 2010, p.10.

notional leverage as the use of non-zero debt betas would reduce the extent to which the post-tax WACC estimate for each service varies with leverage.

454. However, we noted in 2010 that most submissions preferred the use of zero debt betas, that most regulators do not use debt betas (though a minority do), and that we had not used non-zero debt betas in the past. Further, there are practical difficulties in accurately estimating debt betas. Those challenges to the use of non-zero debt betas remain.

455. The High Court's judgment dismissed the appeals from Transpower and MEUG regarding leverage, noting that "…none of the proposed alternatives to the Commission's leverage decision would lead to a materially better IM for either the Energy Appellants or Transpower."[286]

456. The High Court also noted that AIAL conceded that setting leverage using the average of the comparator sample was correct and found that "the Airports' proposed alternative values of leverage would not lead to a materially better cost of capital IM."[287]

457. Transpower successfully challenged the process for determining the leverage parameter of the cost of capital IM in the High Court on the basis that Transpower had not been properly consulted on the approach to leverage. It then submitted, in April 2012, that because its forecast leverage was above that of the comparator firms, leverage in the cost of capital IM should use:[288]

    457.1 Transpower's average forward-looking actual leverage for the value of leverage without further adjustments to the cost of capital IM; or

    457.2 Transpower's average forward-looking actual leverage for the regulatory period for the value of leverage together with a non-zero debt beta; or

    457.3 a notional leverage for the value of leverage that is a weighted average of Transpower's average forward-looking actual leverage for the regulatory period and the average leverage of the comparator firms sample used to derive the asset beta estimate.

458. We did not agree with Transpower's submission for number of reasons, including the fact that we did not consider that variations in a supplier's actual leverage (within prudent levels), in practice, alter its actual cost of capital or its regulatory cost of capital. Further, we argued that the use of actual leverage was inconsistent with how we estimated the value of other parameters in the cost of capital (especially asset

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286 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, p.540.

287 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, p.541.

288 Transpower "Submission on Leverage Value in the Cost of Capital Input Methodology for Transpower" (2012).

beta), and this may have biased the resulting estimate of WACC (unless a debt beta was incorporated).[289]

459. We continue to consider that using the average leverage of the asset beta comparator samples is the best way of dealing with the anomaly. As we have estimated a notional leverage in line with the companies in our asset beta samples, the resulting WACC will be the same for those services regardless of the value assumed for the debt beta.

Updated leverage for comparator samples

460. Leverage figures for our proposed asset beta comparator samples are included below. Table 11 shows leverage figures for the EDB, Transpower and GPB comparator sample, and Table 12 shows leverage figures for the airports comparator sample.

Table 11: EDB, GPB and Transpower comparator sample average leverage results

	Leverage	No. of firms in the sample
2011 - 2016	40%	74
2006 - 2011	42%	74
2001 - 2006	45%	69
1996 - 2001	41%	61

Table 12: Airport comparator sample average leverage results

	Leverage	No. of firms in the sample
2011 - 2016	20%	26
2006 - 2011	18%	25
2001 - 2006	12%	19
1996 - 2001	17%	6

461. Consistent with the approach to estimating asset beta, we have used the average of the two most recent five-year periods (ie, 2006-2011 and 2011-2016) when determining our leverage estimates. Averaging over these periods leads to leverage of 41% for EDBs, Transpower and GPBs, and 19% for airports.

[289] Commerce Commission "Input Methodologies (Transpower) Supplementary Reasons Paper for Leverage in Cost of Capital" (29 June 2012), paras 1.1.7-1.1.18.

Tax

462. This section explains that we do not propose to change our current approach to the corporate and investor tax rates used in estimating WACC.

Corporate tax rate

463. 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%.

464. 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

465. We propose to maintain the approach of using an investor tax rate that reflects the maximum prescribed investor rate under the PIE regime, which is currently 28%. The investor tax rate is the average personal tax rate across all investors in the economy.

466. 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.

467. The IM does not provide for the tax circumstances of individual investors.[290] We consider that using tax rates in the IM that are reflective of those actually used by suppliers is consistent with achieving an appropriate estimate of WACC.

Standard error of the WACC

468. 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:[291]

    468.1 for EDBs, Transpower, and GPBs, the standard error is used to calculate the 67th percentile WACC estimates used for price-quality path regulation; and

    468.2 for airports, we propose to publish the standard error of the WACC, enabling interested parties to generate a distribution for our WACC estimates.[292]

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290 Tax situations specific to particular investors do not, in principle, affect the cost of capital. Taxes are ultimately borne by the individuals themselves, not by the firms of which they are shareholders.

291 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.

292 Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services – Reasons paper" (30 October 2014).

469. We propose that the standard error of the WACC should be changed to 0.0113 for EDBs, Transpower and GPBs, and 0.0144 for airports. This involves two key proposed changes to our 2010 estimates of the standard error of the WACC:

469.1 We propose to revise 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.

469.2 We propose to remove the formula for calculating the standard error of the debt premium, given that there has not been sufficient data available for this to be applied throughout the history of the IMs. Removing the formula would mean that a fixed value of the standard error of the debt premium is applied, and therefore a fixed value for the overall standard error of the WACC can be set.

470. Apart from the two changes listed above, we are proposing to continue using the approach (and input values) explained in the 2010 IMs reasons paper when estimating the standard error of the WACC.[293] Our approach to estimating both the standard error of the asset beta and the standard error of the overall WACC is based on Dr Lally's 2008 advice.[294]

Current approach to estimating the standard error of the WACC

471. 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 use the 'complex analytical approach' described in the 2010 IMs reasons paper to calculate the standard error of the WACC.[295]

472. The standard errors we determined in the 2010 IMs are shown in Table 13.

[293] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) Reasons paper" (December 2010), paras H11.1-H11.67.

[294] Martin Lally "The weighted average cost of capital for gas pipeline businesses" (28 October 2008), see equation 14 and Appendix 3.

[295] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) Reasons paper" (December 2010), para H11.19.

Table 13: Standard errors of the WACC under the current IMs

Parameter	Standard error		
	EDBs/Transpower	**GPBs**	**Airports**
TAMRP	0.015	0.015	0.015
Debt premium[296]	0.0015	0.0015	0.0015
Asset beta	0.13	0.14	0.16
Overall WACC[297]	*0.0106*	*0.0120*	*0.0146*

473. Only the standard error of the asset beta differs by sector. All parameters other than the TAMRP, debt premium, and asset beta are assumed to have a standard error of zero.

Updated standard error of the asset beta

474. We have undertaken updated analysis of the standard error of the asset beta, based on the comparator samples used to estimate asset beta and leverage.[298] Based on this analysis, we propose that:

474.1 an updated standard error of the asset beta of 0.14 should apply to EDBs and Transpower;

474.2 a standard error of the asset beta of 0.14 should continue to apply to GPBs (ie, the same as the value proposed for EDBs and Transpower); and

474.3 a standard error of the asset beta of 0.16 should continue to apply to airports.

475. Data on the standard error of the asset beta for the energy comparator sample is summarised in Table 14.

[296] 0.0015 is the minimum standard error of the debt premium under the IMs, but in practice this value has been used in all of our WACC determinations. This is because there have not been enough bonds available to implement the formula specified in the IMs for estimating the standard error of the debt premium. See paragraphs 485 to 488 for further details.

[297] The standard error of the overall post-tax WACC estimate is calculated using the equation at paragraph H11.19 of the 2010 Input Methodologies reasons paper for EDBs and GPBs. The standard error of the WACC values in this table are based on a fixed value for the standard error of the debt premium of 0.0015.

[298] 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, p.170-178.

Table 14: Standard error of the asset beta for updated energy comparator sample

	2006-2011	2011-2016	Average
Daily	0.1491	0.1233	0.1362
Weekly	0.1483	0.1268	0.1375
4-weekly	0.1434	0.1291	0.1363

476. Consistent with our approach to estimating asset beta, we have placed most weight on the weekly and 4-weekly estimates for the two most recent five-year periods. Averaging over these estimation frequencies and time periods leads to a standard error of the asset beta of 0.14 (rounded to two decimal places).

477. Given that we propose to use the same asset beta for EDBs, Transpower, and GPBs, we consider that the updated standard error of the asset beta 0.14 should apply to all of these sectors.[299] This would result in a slight increase in the standard error of the asset beta for EDBs and Transpower (from 0.13 to 0.14), but is the same standard error of the asset beta that currently applied to GPBs (0.14).

478. We also assessed updated data on the standard error of the asset beta for the airports comparator sample, as summarised in Table 15. Averaging across the weekly and 4-weekly estimates for the two most recent five-year periods would result in a standard error of the asset beta for airports of 0.25.

Table 15: Standard error of the asset beta for updated airports comparator sample

	2006-2011	2011-2016	Average
Daily	0.2396	0.3064	0.2730
Weekly	0.1945	0.2989	0.2467
4-Weekly	0.1862	0.3053	0.2457

479. However, in the original airports IMs decision we adopted a standard error of the asset beta of 0.16 by applying judgement.[300] We noted that averaging over all the time periods considered would have resulted in an average standard error of the asset beta of approximately 0.24. We considered that this was "too high" and "would provide an implausible result".

480. In 2010 we adopted a standard error of the asset beta for airports of 0.16 having regard to the available quantitative estimates, the purpose of ID, and submissions from airports.[301] In particular, NZ Airports' expert at the time (Alistair Marsden, from

[299] As explained in paragraphs 331 to 392, we propose to no longer make an adjustment to the asset beta for GPBs.

[300] Commerce Commission "Input methodologies (airport services) Reasons paper" (December 2010), paras E8.107-E8.114.

[301] Commerce Commission "Input methodologies (airport services) Reasons paper" (December 2010), para E8.114.

Uniservices) submitted that the standard error of the asset beta for airports should be at least 0.15, in response to our 2010 draft view based on a standard error of 0.04.[302]

481. We are faced with a very similar situation now. The updated data suggests a standard error of the asset beta of 0.25, which is very similar to the value of 0.24 which we considered to be an implausible result when setting the original IMs.

482. NZ Airports submitted that it is concerned the existing standard error of the asset beta "may not sufficiently reflect the wide margin of variation across different airports", and that it would:[303]

> …value the opportunity to explore with the Commission the proposition that a much higher standard error should be applied to the asset beta for airports than that applied for the energy sector, and the interrelationship with the WACC range.

483. NZ Airports highlighted certain characteristics of airports that suggest we may not have made sufficient allowance for margin of error (as explained in more detail in the expert report from Bush and Earwaker):[304]

483.1 airports exhibit less homogeneity than gas and electricity businesses, which makes it difficult to identify any commonalities in the risk profiles (eg, there is significant variation in traffic mix, the degree of competition faced from other airports, and the breakdowns of aeronautical versus retail revenues);

483.2 the Commission's comparator sample of asset betas for gas and electricity is much larger and shows far greater uniformity than the airport comparators, so it is surprising that the standard errors are broadly similar; and

483.3 the asymmetry of risks that airports face around costs, volumes and revenues over a long-term horizon (eg, airports are more susceptible to macroeconomic shocks than regulated energy businesses, since air travel is more of a discretionary product than an essential service).

484. We therefore propose that a standard error of the asset beta of 0.16 should continue to apply for airports, for the reasons contained in the original airports IM reasons paper.[305] In addition, we note that:

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302 Uniservices "Comments on the Commerce Commission's Approach to estimate the Cost of Capital in its Input Methodologies Draft Reasons Paper" (12 July 2010), p.13 and 46.

303 NZ Airports "Submission on Commerce Commission's Input Methodologies Review: Invitation to Contribute to Problem Definition" (21 August 2015), paras 76 and 80.

304 NZ Airports "Submission on Commerce Commission's Input Methodologies Review: Invitation to Contribute to Problem Definition" (21 August 2015), para 78. Bush and Earwaker "Evidence relating to the assessment of the WACC percentile for airports" (August 2015), section 2.

305 Commerce Commission "Input methodologies (Airport Services) reasons paper" (22 December 2010).

484.1 an asset beta of 0.58 combined with a standard error of 0.25 would lead to a very wide asset beta range (plus and minus two standard deviations would generate a range from 0.10 to 1.10);

484.2 there appears to be significant variation in the standard error of the asset beta for airports between periods (for example, based on weekly and 4-weekly observations, the standard error of the asset beta for 2006-2011 is approximately 0.19, but for 2011-2016 it is approximately 0.30);

484.3 although NZAA (and the Bush/Earwaker report) suggested that the current standard error of the asset beta of 0.16 may be too low, no alternative estimate (or data to better inform our judgement) was presented;

484.4 while there appears to be less homogeneity in the comparator sample for airports than the comparator sample for EDBs/Transpower/GPB, this will (at least in part) reflect differences in the composition and extent of unregulated activities undertaken by the comparator companies. However, we are estimating the WACC for the regulated activities only, and would expect significantly less variation in asset beta in respect of those activities;

484.5 our estimate of the standard error of the asset beta for airports of 0.16 is greater than for EDBs, Transpower and GPBs, which reflects potentially less homogeneity in regulated airport activities (for example, due to variations in traffic mix, degree of competition);

484.6 a standard error of the asset beta for airports of 0.16 is consistent with advice from NZAA's expert in 2010 (Uniservices); and

484.7 we propose to no longer publish specific WACC percentile estimates for airports ID, diminishing the importance of our standard error estimate.[306]

Standard error of the debt premium

485. Under the current IMs we use an estimate of the standard error of the debt premium that is the greater value of:

485.1 0.0015; or

485.2 the result of Equation 2: Standard error of the debt premium for EDB ID (which is based on cost of capital IMs for EDB ID, as an example).[307]

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306 Instead we propose to only publish a mid-point WACC estimate and standard error of the WACC. Under this approach, the standard error of the WACC would only be one factor when considering airports' targeted rates of return.

307 *Electricity Distribution Services Input Methodologies Determination 2012* [2015] NZCC 32, clause 2.4.5. The same formula is used for other forms of regulation and other sectors (but different clause references apply).

Equation 2: Standard error of the debt premium for EDB ID

$$\sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(p_i-\bar{p})^2}$$

Where:

N is the number of qualifying issuers issuing bonds of the type described in the subparagraphs of clause 2.4.4(3)(d);

p_i is each qualifying issuer's arithmetic average spread for its bonds of the type described in the subparagraphs of clause 2.4.4(3)(d); and

p is the debt premium,

provided that for the purposes of determining *N* and p_i, no regard may be had to any bonds of the types described in clauses 2.4.4(4)(b) to 2.4.4(4)(e).

486. Although 0.0015 is the minimum standard error of the debt premium specified under the IMs, in practice this value has been used in all of our WACC determinations. This is because there have not been enough bonds of the type described in subparagraphs of clause 2.4.4(3)(d) (or equivalent clauses for other sectors / forms of regulation) available for the formula specified in the IMs to be applied.[308]

487. Given that equation for estimating the standard error of the debt premium has never been able to be applied, we propose that it should be removed from the IMs. This means that a fixed standard error of the debt premium of 0.0015 would apply.

488. Using a fixed value for the standard error of the debt premium of 0.0015 would simplify the IMs. This would enable a fixed value for the standard error of the WACC to be determined, removing the need to re-calculate the standard error on an ongoing basis.

Draft review regarding overall standard error of the WACC

489. Based on the analysis described above, we propose that the standard errors in Table 16 should apply.[309]

[308] We note that this will still be the case if majority government owned bonds are given the same weighting as non-majority government owned bonds.

[309] The standard error of the overall post-tax WACC estimate is calculated using the equation at para H11.19 of the 2010 Input Methodologies reasons paper for EDBs and GPBs. 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 0.0113 (for EDBs/Transpower/GPBs) and 0.0144 (for airports) when rounded to four decimal places.

Table 16: Updated standard errors of the WACC under this draft determination

Parameter	Standard error	
	EDBs/Transpower/ GPBs	**Airports**
TAMRP	0.015	0.015
Debt premium	0.0015	0.0015
Asset beta	0.14	0.16
Overall WACC	*0.0113*	*0.0144*

490. The proposed application of the standard error of the WACC for airports is described in more detail in the Topic paper 6.[310]

[310] Commerce Commission "Input methodologies review draft decisions: Topic paper 6 – WACC percentile for airports" (16 June 2016).

Chapter 6: Additional cost of capital issues

Purpose of this chapter

491. This chapter explains our draft findings 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. This includes:

491.1 incentives to apply for a CPP; and

491.2 issues raised by the High Court in its judgment on the merits appeal to the setting of the original IMs, including;[311]

491.2.1 the choice of the SBL-CAPM to estimate the cost of capital;

491.2.2 the appropriate WACC percentile; and

491.2.3 the implementation of a split cost of capital.

Incentives to apply for a CPP

492. The current IMs apply a prevailing approach to estimating the cost of capital. We determine a new WACC each year that applies to any supplier making a CPP application. The CPP WACC applies to both sunk assets that make up the opening RAB and also the capex that is forecast to take place during the CPP.

Issues with the current approach

493. We outlined the potential issue with the current approach to setting a CPP WACC in the problem definition paper.[312] Divergence between the revised WACC that will apply to CPPs and a supplier's existing WACC under a DPP may create perverse incentives for a supplier to either apply or not apply, for a customised price-quality path.

494. This may not be to the long-term benefit of consumers, because a supplier may not apply for a CPP when it is in the interests of consumers for it to do so (eg, because it requires a step-change in investment that will benefit consumers). Similarly it may apply for a CPP when it is not beneficial to consumers (eg, to achieve an allowance based on a higher WACC, even if its costs have not changed).

495. If the CPP WACC is lower than the DPP WACC, then a supplier potentially has an incentive not to apply for a CPP.[313] Given the much larger size of the RAB compared

311 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289.

312 Commerce Commission "Input methodologies review invitation to contribute to problem definition" (16 June 2015), Topic 3.

313 Particularly if it has undertaken steps to manage its debt financing risk on the expectation that the WACC will be fixed for five years

to potential new capex over the CPP period, the difference between CPP and DPP WACC is likely to be a significant driver of whether to apply for a CPP or not.

496. This issue was originally intended to be fast-tracked under the IM review because it was considered a critical factor for any CPP applications in 2016. However, following our understanding that no potential applicants were intending to apply for a customised price-quality in 2016, the urgency of considering the issue prior to 2016 was diminished and it was subsequently folded into the main review.[314]

497. To help decide whether the incentive problem was significant enough to warrant resolving, and to seek advice on options for doing so, we commissioned a report from Dr Lally.[315]

498. In his report, Dr Lally identified four broad solutions to the WACC alignment incentive issue:

498.1 annual updating of the cost of debt – indexing the price path to the cost of debt (Option 1);

498.2 using a long-term trailing average cost of debt when setting the WACC (Option 2);

498.3 applying the DPP WACC to any CPP application (Option 3); and

498.4 implementing a split (or dual) WACC in which the DPP WACC is applied to existing assets and the DPP capex allowance, while the CPP WACC is applied to additional capex provided for under a CPP (Option 4).[316]

499. Dr Lally's conclusion was that the approach that best dealt with the identified incentive problem is the implementation of a dual WACC approach (Option 4). He also considered that if a single WACC is required then the DPP WACC should be applied, because the incentive problems are much larger in relation to existing assets compared to additional capex allowed under a CPP.

Proposed approach to the WACC alignment issue

500. We propose to remove the requirement to determine a CPP-specific WACC from the cost of capital IM. Under this proposal, the WACC determined for the DPP would apply for a fixed term of five years, even for suppliers that moved onto a CPP. If a new DPP WACC was determined part way through a CPP, we would reopen the CPP

314 For further information on these decisions, see: Commerce Commission: "IM review second process update paper CPP fast track amendments" (9 October 2015).

315 Dr Martin Lally "Complications arising from the option to seek a CPP" (18 September 2015).

316 We have classed the approach in which we apply a different WACC to incremental capex under a CPP as the 'dual WACC approach' rather than the split WACC which is described in Dr Lally's report. This ensures that there is no confusion with a more general consideration of a split cost of capital that is described in paras 541-555.

and adjust prices for the remainder of the CPP to reflect that new DPP WACC. The adjusted prices would be consistent with the allowed return on capital over the remainder of the period being equivalent to the new DPP WACC.

501. Forecast revaluation gains under a DPP or CPP are based on forecast CPI. For consistency we would therefore need to ensure that these forecasts are provided at a time at which the WACC is determined. For example, when determining a forecast of revaluation gains for a CPP, we would use CPI forecasts made at the time the DPP WACC was determined. This earlier CPI forecast could have been a number of years prior to the start of the CPP but it ensures consistency with our economic principle of ex-ante FCM.[317] Similarly, when the DPP WACC is updated and we reopen the CPP, we would need to use an updated forecast of CPI to update the forecast of revaluations for the remainder of the CPP.

502. We consider that applying the DPP WACC to CPPs significantly limits the incentive problems that can occur when application of a CPP coincides with significant differences between the CPP and DPP WACC rate.[318] Fluctuations in interest rates would therefore no longer be a significant consideration in whether a supplier applies for a CPP or not.

503. We received a number of submissions supporting this approach.[319] For example, Orion suggested that:

> We support the view that CPP WACC should be fully-aligned with DPP WACCs. This would eliminate perverse incentives and disincentives for CPPs. It would also reduce uncertainty. Full alignment is the only method to fully eliminate these effects. This could require (depending on the regulatory period of the CPP) a technical price reset part way through a CPP regulatory period to account for any change to the prevailing DPP WACC, by way of a recoverable cost.

504. Vector and Aurora did not support the decision to apply the DPP WACC to CPPs because they thought our focus should be on reducing WACC volatility more generally and not just in relation to this specific issue.[320]

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317 Commerce Commission "Input methodologies review draft decisions: Topic paper 1 – Form of control and RAB indexation for EDBs, GPBs and Transpower" (16 June 2016). Other forecasts of inflation used in the setting of the CPP (eg, those used to set the starting price) would not need to be consistent with the setting of the DPP WACC.

318 In terms of the potential incentive problems resulting from a difference between the DPP and CPP WACCs, we note that it is only changes in the real WACC that matter because changes in inflation are addressed through the indexation of RAB by actual inflation.

319 Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 7; PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016); ENA "Submission on IM review: Cost of capital" (9 February 2016), para 23; Powerco's submission on cost of capital update paper "Scope and process for fast track amendments to the CPP input methodology requirements" (5 February 2016), p.2; Wellington Electricity "Input methodologies review – Cost of capital" (9 February 2016), p.1.

505. We consider that the application of the DPP WACC for CPPs is a practical approach that would significantly reduce the overall potential for suppliers to be subject to perverse incentives regarding whether to apply for a CPP that would not provide long-term benefits to consumers. We also note that this approach does not rule out moving to a trailing average approach more generally to determine the cost of debt.

506. The approach has the added benefit of removing the need to determine a separate CPP WACC.

507. We consider the most appropriate way to apply a new DPP WACC to the CPP would be through a reopener that updates the allowance for the return on capital at the time a new DPP WACC is determined.

508. We, therefore, propose to introduce an ability to reconsider a CPP following a WACC change. When reconsidering the path in this context, we would use the new WACC for all inputs to the building blocks model that is used to update a supplier's allowable revenue. We would also update the forecast CPI used to determine the forecast revaluations to ensure that we maintain the provision of a real return on regulated assets.[321]

Alternative option 1 – Application of a dual WACC approach

509. One of the issues with applying the DPP WACC to existing assets is that it can cause problems with significant new investment under CPP, if the prevailing (market) WACC at the time of a CPP application is higher than the older DPP WACC. Specifically, as noted by Dr Lally:[322]

> … the old WACC would also apply to any capex that was a consequence of the CPP, and an incentive problem therefore applies to this capex. In particular, if the old WACC is applied to the CPP capex [capex in a CPP above what was allowed for under the DPP], any increase in WACC after the old WACC is set reduces the net cash flows on the CPP capex (by raising their cost of capital but not the allowed revenues), and thus the incentives to adopt a CPP are reduced. Similarly, any subsequent decrease in WACC raises the net cash flows on the CPP capex (by reducing their cost of capital but not the allowed revenues), and thus the incentives to adopt a CPP are increased.

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320 Vector "Input methodologies review – Update paper on the cost of capital topic" (5 February 2016), para 3; Aurora "Input methodologies review: Update paper on the cost of capital topic" (5 February 2016), p.3.

321 Commerce Commission "Input methodologies review draft decisions: Topic paper 1 – Form of control and RAB indexation for EDBs, GPBs and Transpower" (16 June 2016).

322 Dr Martin Lally "Complications arising from the option to apply for a CPP" (18 September 2015), p.4.

510. An alternative approach, as suggested by Dr Lally, is to apply a dual WACC approach.[323] Under this approach, for a CPP:

510.1 the DPP WACC would be applied to existing assets and capex that was originally allowed for under the DPP; and

510.2 the CPP WACC would be applied to additional (incremental) capex provided for under a CPP that was not allowed under the DPP.

511. Applying a different WACC to different types of capex further reduces the identified incentive problem. Although we consider it is possible to implement an option of this type, there are some complexities in applying this approach. As shown in Attachment E the potential impact on the price path is likely to be less than 1% of total revenue because the incremental capex affected is likely to be a small proportion of capex.

512. Applying a dual WACC option would require us to calculate a CPP WACC based on debt terms that are consistent with the time period to the next DPP reset. This is likely to be shorter, and potentially considerably shorter, than the standard five-year regulatory pricing period. For example, we may need to apply WACC based on a 1-year risk-free rate/debt premium if the DPP reset is only one year after the start of the CPP. This would increase the number variants of the CPP WACC (based on different time periods) we would need to determine annually for each sector.

513. Submissions from suppliers did not favour a dual WACC approach, suggesting that there are number of difficulties in implementing such an approach. These difficulties include:

513.1 identifying CPP and DPP capex;[324]

513.2 the use of single WACC values as inputs to price-quality path calculations (eg, in the IRIS mechanism, timing factors);[325] and

513.3 consideration of how subsequent changes to the WACC would take place once assets were subject to different WACCs.[326]

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323 We have classed the approach in which we apply a different WACC to incremental capex under a CPP as the 'dual WACC approach'. This ensures that there is no confusion with a more general consideration of a split cost of capital that is described in paras 541-555.

324 PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 117; Houston Kemp "Comment on the Commerce Commission's cost of capital update paper" (report prepared for Powerco, 5 February 2016), p.22.

325 Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 58.

326 Houston Kemp "Comment on the Commerce Commission's cost of capital update paper" (report prepared for Powerco, 5 February 2016), p.22.

514. Contact and MEUG suggested that we should at least explore the dual WACC approach.[327]

515. We do not consider the issues identified by suppliers provide insurmountable barriers to implementing a dual WACC approach.[328] However, there is no doubt it would add complexity to the regime. This complexity would result in administrative costs to us and suppliers that are likely to be more significant than the incentive benefits, given that it would only affect a small element of capex.

Alternative option 2 – Update the WACC annually

516. Dr Lally considered two other options that required a change to the way that we estimate WACC more generally, which may have a benefit in reducing the potential for perverse incentives for firms applying for a CPP.

517. These options were to:

517.1 update the WACC annually; and

517.2 apply a trailing average approach.

518. These options could potentially have helped to reduce the CPP incentive issues. However both options:

518.1 would have still resulted in a least some difference between the CPP and DDP WACC, given that we would not be updating the cost of equity, such that perverse incentives could still exist to some extent; and

518.2 have already been rejected as a change to the cost of debt for other reasons.

519. A number of submissions suggested that the impact on CPP incentives should only be a secondary consideration when determining the most appropriate cost of debt methodology.[329] We agree, and under these circumstances have not considered applying either annual updating or applying a trailing average approach to mitigate the CPP incentive problem.

The SBL-CAPM model for calculating the cost of equity

520. The current IMs use the SBL-CAPM to estimate the WACC. Use of a CAPM is the most commonly used method by finance practitioners around the world to estimate the

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327 Contact Energy [PUBLIC] "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), p.12; MEUG's submission on input methodologies review process paper – update on fast track amendments "Comments on CPP fast track" (10 July 2015), para 7.

328 For example, we could assume that only the Regulated Investment Value (RIV) for a CPP over and above the DPP RIV would be subject to the CPP WACC, use just the DPP WACC for some of the regulatory calculations, and predefined rules for future scenarios.

329 ENA "Submission on IM review: Cost of capital" (9 February 2016), para 22; Vector "Input methodologies review – Update paper on the cost of capital topic" (5 February 2016), para 3.

cost of equity and the SBL-CAPM is a version that best fits the particular features of the New Zealand taxation system.

521. The problem definition paper identified that the High Court questioned the suitability of the SBL-CAPM, particularly with regard to the 'leverage anomaly'.[330]

522. Submissions to the problem definition paper and the subsequent WACC update paper generally considered that we should continue to use the SBL-CAPM. The ubiquity of the SBL-CAPM in New Zealand and the limited development of alternatives to the SBL-CAPM were the main reasons given for this view. For example PwC suggested that:[331]

> We agree with the Paper that there is limited value in undertaking substantive analysis of alternatives to the SBL-CAPM, and submit that there is little evidence, of a substantial nature, which suggests that the rationale for the 2010 decision to use the SBL-CAPM no longer applies.
>
> Both the Fama-French model and the Black CAPM were rejected when the IMs were determined for a relative lack of use amongst practitioners and regulators. In addition, Fama-French was rejected due its extra complexity and requirement for additional input data; and Black because of a lack of evidence for any superiority to the SBL-CAPM. As the Paper points out, no evidence has arisen in the interim to counter those conclusions, and importantly the Australian Energy Regulator (AER) also rejected the use of the Black CAPM in 2013.

523. Other support for retaining the SBL-CAPM as the model to estimate the cost of equity was received from Contact, Orion, Transpower, and Wellington Electricity.[332]

524. Some suppliers qualified their support for the SBL-CAPM by suggesting that we should make adjustments for "known bias" in the model. The most commonly cited bias was that we should make an adjustment for low beta stocks. For example, Transpower suggested that:[333]

> The SBL-CAPM should be retained, but the accuracy of cost of equity estimates derived using this model may be improved by using the Black-CAPM to correct the well-known low-beta

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330 The 'leverage anomaly' is the inherent characteristic of the SBL CAPM that results in the WACC increasing with the level of leverage. This is contrary to what is observed in the real world whereby firms typically borrow to some extent. See: Commerce Commission "Input methodologies review invitation to contribute to problem definition" (16 June 2015), para 255.2. We consider that we address this anomaly by adopting the average leverage of the comparator samples that we use to estimate asset beta, as discussed in Chapter 5.

331 PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 10.

332 Contact Energy [PUBLIC] "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), p.2; Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 14.2; Transpower's submission "Update paper on the cost of capital" (5 February 2016), p.1; Wellington Electricity "Input methodologies review – Cost of capital" (9 February 2016), p.2.

333 Transpower's submission "Update paper on the cost of capital" (5 February 2016), p.1;

bias in the SBL-CAPM (placing some weight on both the adjusted and unadjusted SBL-CAPMs).

525. MGUG submitted more strongly that we should consider alternative models.[334]

MGUG submits that reliance on a single theoretical model for determining cost of equity is inferior to use of a number of models to arrive at a better judgment.

526. MGUG also suggested that if we were to continue using a CAPM we should consider using non-local settings, given that a number of the owners of New Zealand regulated business are based overseas and we use overseas firms in the comparator sample to determine some parameter inputs.[335]

527. We made clear in 2010 that the SBL-CAPM is not without its limitations and it has performed relatively poorly in empirical tests. Despite this we maintain our view from 2010 that we do not consider that any of the alternative model suggestions are likely to provide more robust estimates then the SBL-CAPM. Our previous reasons for rejecting these models were:

527.1 Black CAPM because there was no clear evidence of its superiority to SBL-CAPM and the fact it has not been widely used elsewhere.[336] We also noted that the use of a 5-year risk-free rate (rather than shorter-term risk-free rates often used in academic studies) is likely to flatten the securities market line (due to the higher price of longer-term debt) mitigating impact of any low beta bias.[337]

527.2 Fama/French model because of difficulties in obtaining data and ongoing debate on its theoretical merits.[338]

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334 MGUG "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), para 9.

335 MGUG suggest we local (New Zealand) estimates of the risk free rate, debt premium, debt issue costs, and investor tax rates may not be appropriate. MGUG "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), para 20.

336 We note that the AER has provided some weight to the theories of the Black CAPM when determining equity betas. However they have rejected the use of specific parameters directly estimated from a Black CAPM. See: AER "Better regulation: Rate of return guideline" (December 2013), appendices, A.3.1. Available at: https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/rate-of-return-guideline/final-decision; and, for example, AER "Final decision: SA power networks determination 2015−16 to 2019−20: Attachment 3 − Rate of return" (October 2015), section A.3.3. Available at: https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/sa-power-networks-determination-2015-2020/final-decision

337 Franks, Lally and Myers "Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology" (report to the Commerce Commission, 18 December 2008), para 44.

338 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H2.26.

527.3 International CAPM because of difficulties in estimating data inputs and because the WACC should be independent from the ownership of a firm (ie, whether they are based overseas or not).

528. As noted above, the SBL-CAPM does not provide a precise estimate of the WACC and there appear to be reasons why it could be both over or underestimating the required return to New Zealand regulated businesses.

529. On the whole we consider there is a greater chance that the SBL-CAPM overestimates the WACC than underestimates the WACC. This because we are using domestic parameter inputs, even though a significant amount of investment in regulated suppliers in New Zealand is capital raised overseas.

530. We consider that, if the data was available, using an International CAPM would be likely to result in a lower WACC than the SBL-CAPM. This is due to the potential for overseas firms, depending on their individual arrangements, to pay lower tax on equity, achieve lower debt raising costs and have a greater ability to diversify investments.[339]

531. Although, there is some evidence to suggest that the WACC may be generous to suppliers, we consider that the SBL-CAPM provides a reasonable estimate of the cost of capital for regulated suppliers. Its wide-ranging use by New Zealand finance practitioners means that we consider it is the most suitable model for estimating a benchmark WACC.

532. We do not consider that using an alternative model would lead to a better estimate of WACC. We particularly note that other regulators generally prefer the CAPM and have often rejected alternatives.[340] The simplicity and intuition of the SBL-CAPM also works to its advantage.

533. We, therefore, do not propose to change the choice of model used to estimate the cost of equity when determining the WACC.

Black's simple discounting rule

534. An issue related to the choice of model is the potential to use BSDR as a cross-check on the WACC determined using the SBL-CAPM. We discuss the potential for this in Chapter 7.

339 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para 6.4.35.

340 We note the AER rejected the use of Fama/French and Black CAPM other than in very limited circumstances. See: AER "Better regulation: Rate of return guideline" (December 2013), appendices, Section A. Available at: https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/rate-of-return-guideline/final-decision.

WACC percentile

535. The WACC we determine is an estimate of the returns required by investors. The uncertainty of the estimate compared to the true WACC means that we estimate a standard error of the WACC from which can define a probability distribution.

536. When setting the original IMs we used the 75th percentile of this distribution to determine the WACC used for setting price-quality paths for electricity and gas businesses. As part of the judgment on the merits appeal to the original IMs the High Court outlined scepticism on the need for a WACC uplift. The resulting uncertainty led to us bringing forward an assessment of this particular issue in 2014 and resulted in a WACC percentile amendment.[341] This amendment reduced the percentile used for price-quality regulation in the electricity and gas sectors from the 75th to 67th percentile.[342]

537. Submissions from suppliers agreed with our view that this should not be a topic of focus for the review. For example Orion noted that:[343]

> The Commission, in response to the High Court, decided to reduce the percentile used for price setting from the 75th to the 67th. This change was made by the Commission following a significant amount of evidence and debate. We do not support any further reconsideration of the WACC percentile.

538. Contact and MEUG both considered that we should re-evaluate the use of the 67th percentile and both recommend a move to the 50th percentile. MEUG submitted evidence from recent transactions of regulated businesses to support a lower WACC.[344]

539. We consider that ongoing evaluation of RAB multiples is useful, particularly with regard to assessing the reasonableness of our WACC estimates. However, we do not propose to make any change to our use of the 67th percentile for electricity and gas businesses for price-quality paths, given the significant amount of analysis that was undertaken in this area in 2014 and the lack of new evidence to justify a further detailed review at this stage.

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341 Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services – Reasons paper" (30 October 2014).

342 A summary of the WACC percentile amendment process is provided in the problem definition paper. See: Commerce Commission "Input methodologies review invitation to contribute to problem definition" (16 June 2015), paras 256-258.

343 Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 14.1; PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 30; Transpower's submission "Update paper on the cost of capital" (5 February 2016), p.11; Aurora "Input methodologies review: Update paper on the cost of capital topic" (5 February 2016), p.2.

344 RAB multiples are discussed in more detail in Chapter 7.

540. We are however considering the WACC percentile range in relation to airports, because the airport sector was not part of the final 2014 analysis. Our assessment of the relevance of the WACC percentile range for airports is considered in Topic paper 6.[345]

Split cost of capital

541. The High Court (in its judgment on the merits appeal to the original IMs) outlined that it expected us to consider a split cost of capital approach, given its scepticism about the original IMs using a WACC substantially higher than the mid-point (ie, the 75th percentile). [346]

542. The comments from the Court were in relation to a proposal outlined by MEUG which suggested that different estimates of the WACC should be applied to the existing RAB and capital reflecting newly installed assets.

543. MEUG suggested that the WACC estimate used for already committed or approved capital should be equivalent to the 50th percentile and the WACC estimate used for new capital should be the 75th percentile. When making our decision to amend the WACC percentile that applies to the single estimate currently specified in the IMs, we outlined that we would consider a split cost of capital approach as part of the IM review.[347]

544. Applying a split cost of capital approach in a similar manner to that proposed by MEUG is a not a new idea for regulators. A number of UK regulators considered the issue in response to proposals by Professor Dieter Helm in a number of academic papers.[348] A more recent study was been undertaken by the Queensland Competition Authority (QCA) in 2014. We evaluated how a number of other regulators have considered this issue as part of the WACC update paper.[349]

545. The proposal by MEUG has some differences compared to Helm's original proposal. In particular, Helm's proposal suggests that existing assets should only be compensated at the cost of debt, whereas MEUG has suggested that the 50th percentile of the WACC is more appropriate. Also, Helm indicated that lower WACC should be applied to assets as soon as they enter the RAB, while MEUG's proposal appears to indicate that they would expect an asset to receive the higher WACC for a longer period of time.

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345 Commerce Commission "Input methodologies review draft decisions: Topic paper 6 – WACC percentile for airports" (16 June 2016).

346 The split cost of capital approach was described in the High Court judgment as the 'two-tier proposal'. See: *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1486].

347 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 4.46-4.47.

348 For example: Dieter Helm, "Ownership, utility regulation and financial structures: an emerging model" (14 January 2006). Available at: www.dieterhelm.co.uk/node/632

349 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), paras 4.33-4.44.

546. Despite these differences, the fundamental element of both proposals is the same, ie, that two separate WACCs are applied to a regulated firm's assets. Most of the issues assessed by other regulators, and considered by us here, relate to the splitting of the cost of capital per se, without reference to the level of compensation. Estimates of the appropriate compensation for different categories of capital would need to be determined as a separate exercise following a conclusion that splitting the cost of capital itself was appropriate.

Our assessment of the of a split cost of capital

547. It appears that an appropriately implemented split cost of capital could potentially be a useful method to understand the differences in risk between sunk assets in the RAB and new investments and consequently determine a separate (and thus more accurate) return.

548. The main benefits would accrue from:

548.1 an overall return more consistent with the risks faced by the business - to the extent that the current single WACC misprices overall risks and it can be improved by moving to the a split cost of capital approach; and

548.2 improved efficiency incentives for new investment - to the extent that a revised WACC for new investment is more consistent with the actual cost of capital for new investment.

549. However, a number of issues need to be overcome before a split cost of capital could be implemented. As noted by other regulators, the main disadvantages appear to be:

549.1 Significant complexity in application, particularly in determining the WACC for different types of capital. Although the QCA suggested that this problem is not insurmountable it did not outline how robust estimates of the appropriate split WACCs could be achieved in practice. A split cost of capital approach will only be able to more accurately price risks to the specific types of capital if we are able to robustly determine the relevant WACCs.

549.2 Potential for a regulatory shock from a change in approach to estimating the cost of capital. Although the QCA has identified this as a potential issue, at least in the short term, it considered that the benefits outweigh any costs of this shock. This conclusion appears to be based on a view that its existing 'single WACC' methodology for determining the cost of capital results in significant 'economic rent' to suppliers which would be removed under a split cost of capital approach.

550. In assessing this trade-off we consider it is significant that the potential costs (ie, implementation difficulties and increased regulatory risk) are evident and real, but the potential benefits are less clear cut and more ambiguous.

551. Given the potential for these disadvantages to be significant, we propose that it is inappropriate to apply a split cost of capital approach when setting the cost of

capital for regulated suppliers. In taking that position we considered the following factors are particularly relevant.

551.1 The potential to improve the overall pricing of risk is likely to have been significantly reduced since the High Court judgment in 2013. Since then we have amended the WACC percentile following substantial analysis of the costs and benefits to consumers of using particular WACC percentiles. [350]

551.2 It will be difficult to predict whether investment incentives will be improved. The incentive to invest depends on an investor's expectation of a return over the lifetime of an asset. This will in turn depend on implementation of any split cost of capital approach and the confidence with which investors expect the arrangements to endure.

551.3 A number of submissions from suppliers during the IM review period have strongly urged us not to spend further time and resource assessing this issue, unless some of the implementation issues are addressed, and no further submissions on its practical application have been received.

551.4 A number of international regulators have considered this issue and rejected its implementation. As far as we are aware, no recent evidence has been made available that would be likely to make other regulators reconsider their conclusions on this issue.

551.5 The High Court noted that it was not presented with a clear means of implementing a split cost of capital approach. We are not aware of any new material that would change that view.

552. Submissions to the WACC update paper from suppliers reiterated their view that the split cost of capital approach should not be implemented or even further considered. For example PwC suggests that:

> We support the Paper's stated intention that further work will not be undertaken on the 'split cost of capital' approach proposed by the Major Electricity Users Group (MEUG). We consider that this is a reasonable conclusion given the evidence set out in the Paper. We agree that the disadvantages of such an approach – namely, the additional practical complexity, and the potential to reduce incentives for investment – are likely to be significant. We also agree that any potential benefits are uncertain.

553. Other submissions from suppliers also agreed with our proposal not to undertake further work in this area. [351]

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350 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015).

351 Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 14.3; Aurora "Input methodologies review: Update paper on the cost of capital topic" (5 February 2016), p.2; PwC (on behalf

554. MEUG submitted that they still considered that ongoing evaluation of the split cost of capital would be useful but they provided no specific information on how this might be undertaken or how they envisaged a split cost of capital might be implemented.[352]

555. As a result, submissions on the split cost of capital have not changed our view that was expressed in the WACC update paper that, on balance, there is unlikely to be any long-term benefit to consumers from introducing a split cost of capital.

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of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 29 ; Transpower's submission "Update paper on the cost of capital" (5 February 2016), p.10.

352 MEUG "Submission on cost of capital update paper" (5 February 2016), paras 13-17.

Chapter 7: Reasonableness checks

Purpose of our reasonableness checks

556. This chapter discusses whether our WACC estimates, if we adopted the proposals set out in this paper, are reasonable compared to other WACC estimates. We have separately considered the reasonableness of our WACC estimates for EDBs/Transpower/GPBs, and airports.

557. 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 2010 IMs reasons paper, and the 2014 WACC percentile reasons paper.[353]

558. Unless otherwise indicated, all relevant calculations and reasonableness checks discussed in this chapter were conducted using the current cost of capital IMs, updated to reflect proposed changes discussed in this paper (which we refer to in this chapter as the 'draft amended cost of capital IM').

559. Based on the analysis we have undertaken, we consider that our WACC estimates based on the draft amended cost of capital IMs are reasonable. In particular:

    559.1 Our 67th percentile post-tax WACC estimate for EDBs, Transpower and GPBs of 5.31% is within the range of independent post-tax WACC estimates for regulated energy businesses in New Zealand, similar to regulatory WACC estimates from Australia and above regulatory WACC estimates from the UK (after normalising for differences in risk-free rates).[354]

    559.2 Although limited evidence is available to test the reasonableness of our WACC estimate for GPBs specifically, the observed RAB multiples for the recent sales of Vector and Maui's gas businesses to First State Funds suggest that the current regulatory settings are sufficient to compensate investors for putting their capital at risk (even after allowing for the expected impact of reducing the asset beta for GPBs, as we are now proposing).

    559.3 Our mid-point post-tax WACC for airports of 6.17% is within the range of alternative New Zealand sourced post-tax WACC estimates for airports, and

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353 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), Appendix H13; and 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 D.

354 Our reasonableness checks analysis focusses on the 67th percentile WACC estimate for EDBs, Transpower, and GPBs, given that this is the percentile used for price-quality path regulation of these businesses. However, we note that our mid-point post-tax WACC estimate of 4.81% is also within the range of comparative information considered.

within the range of overseas WACC estimates from the UK and Ireland (after normalising for differences in risk-free rates).

560. The rest of this chapter:

560.1 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;

560.2 summarises why we consider our WACC estimates for EDBs/Transpower/GPBs and airports (as at 1 April 2016) are reasonable based on the information assessed;

560.3 describes in detail the comparative information used when undertaking reasonableness checks for EDBs/Transpower/GPBs and airports, respectively;

560.4 outlines the RAB multiples analysis we have undertaken, as an additional reasonableness check; and

560.5 discusses BSDR, as a possible alternative method to consider the appropriate return applied to a regulated business.

Approach to undertaking reasonableness checks of our WACC estimates

561. This section explains the approach we have used when undertaking reasonableness checks of our WACC estimates, including:

561.1 the publicly available comparative information we have considered;

561.2 the weight placed on WACC estimates from different sources; and

561.3 our approach to adjusting WACC estimates from other sources, to ensure they are comparable with our estimates.

We have used publicly available post-tax WACC estimates

562. When undertaking our reasonableness checks, we have used publicly available information on:

562.1 the current New Zealand post-tax risk-free rate and the post-tax cost of corporate debt;

562.2 historic and forecast estimates of the returns achieved by New Zealand investors on an investment of average risk;

562.3 independent estimates of the post-tax WACC for suppliers of regulated services in New Zealand (and similar businesses), including estimates from PwC and New Zealand investment banks; and

562.4 estimates of the post-tax WACC from other regulatory contexts, particularly Australia and the United Kingdom.

563. Our WACC estimates for EDBs/Transpower/GPBs and airports, as at 1 April 2016, are compared to the publicly available information listed above. Our WACC estimates are calculated based on the draft cost of capital IMs set out in this paper. If the draft IMs produce reasonable WACC estimates as at 1 April 2016, we consider they will also produce reasonable estimates at other dates since the risk-free rate and debt premium will be linked to prevailing market rates.

564. We have compared our post-tax WACC estimate with independent estimates, as the comparative information is generally available on a post-tax basis only. All references to WACC in this section should be read as references to post-tax WACC.

We have placed most weight on NZ-sourced WACC estimates for regulated services

565. We have used a hierarchy of publicly available comparative information when assessing the reasonableness of our WACC estimates. In particular, we consider the available information should be considered in the following order of importance.

565.1 *The plausible range:* Our WACC estimates are compared with a plausible range of returns on the New Zealand market bounded at the upper end by the historical and expected future returns on the New Zealand market for a firm of average risk (using estimates from brokers and practitioners). The plausible range is bounded at the lower end by five-year government bond rates (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).[355]

565.2 *NZ-sourced estimates of the cost of capital for regulated suppliers and similar businesses:* Our estimates are compared with available information on the cost of capital for New Zealand suppliers of regulated services sourced from brokers and practitioners, and unregulated businesses with significant market power.

565.3 *Overseas estimates of the regulated cost of capital:* Our estimates are compared with cost of capital estimates from overseas regulatory decisions (primarily from Australia and the UK) for electricity lines services, gas pipeline services, and airports.

[355] 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.

566. We consider that New Zealand sourced WACC estimates should be given more weight than overseas estimates. International WACC estimates can be affected by a number of country-specific factors such as differences in tax regimes, monetary conditions, regulatory regimes, and investors' relative risk aversion. In its judgment 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".[356]

We have normalised for differences in risk-free rates

567. We have normalised the comparator WACC estimates for differences in risk-free rates.[357] This is because our analysis is intended to assess the overall reasonableness of our WACC estimates, rather than highlighting differences resulting simply from adopting an alternative approach to estimating the risk-free rate.

568. Under the draft amended cost of capital IM, we use prevailing interest rates when determining the risk-free rate.[358] In contrast, some other analysts and regulatory authorities use long-term averages when estimating the risk-free rate.

569. During periods where domestic interest rates are relatively low in New Zealand, our WACC estimates are likely to appear low compared to other estimates. Conversely, during periods where New Zealand interest rates are high, our WACC estimate 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.[359]

570. To normalise for the difference between prevailing risk-free rates and long-term averages of the risk-free rate, we have adjusted comparator WACC estimates to reflect our estimate of the risk-free rate as at 1 April 2016 (which is 2.60%).[360]

We have considered RAB multiples, as an additional reasonableness check

571. As part of our reasonableness checks, 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

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356 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1213].

357 We have not standardised WACC estimates for differences in the debt premium. The amounts involved are significantly smaller and have a limited effect on the analysis.

358 Using prevailing interest rates when determining the risk-free rate is consistent with our approach in the 2010 IMs.

359 Similarly, our current WACC estimates for EDBs, Transpower, GPBs, and airports, as outlined in this paper, appear relatively low compared to those presented in our 2010 IMs reasons papers. This largely reflects a reduction in the risk-free rate over this period. Our estimate of the risk-free rate as at 1 September 2010 was 4.64%, while our current estimate of the risk-free rate (as at 1 April 2016) is 2.60%.

360 Specifically, our standardisation adjusts independent WACC estimates for the difference between the risk-free rate we use, and the risk-free rate used by independent analysts.

set at a sufficient level to adequately compensate investors for putting their capital at risk.[361]

572. In particular, RAB multiples for the recent sales of Vector and Maui's gas businesses to First State Funds provide useful evidence to assess the reasonableness of our proposed approach for GPBs. There is a lack of independent New Zealand sourced WACC estimates available for GPBs – for example, we have not identified any recent GPB-specific WACC estimates from brokers or practitioners. Given the lack of alternative information to assess the reasonableness of our WACC estimate for GPBs, we consider RAB multiples evidence to be helpful for this sector.

Summary of why we consider our WACC estimates are reasonable

573. We consider that our WACC estimates are reasonable based on the comparative information we have assessed. Our findings for EDBs/Tanspower/GPBs and airports are summarised in Figure 10 and Figure 11, respectively.

574. Our analysis for EDBs, Transpower, and GPBs focusses on the 67th percentile WACC estimate, given that this is the percentile used for price-quality path regulation of these businesses. We consider that our 67th percentile post-tax WACC estimate of 5.31% (as at 1 April 2016) is reasonable given it is:

574.1 below the long-term historical return (8.72%) and the forecast return on New Zealand investments of average risk (7.17%-7.39%), but well above the post-tax returns on five-year government stock (1.87%) and five-year BBB+ bonds (3.06%). This is consistent with expectations as businesses such as EDBs, Transpower and GPBs face lower risks than the average New Zealand firm, but greater risks relative to corporate bonds and government stock;

574.2 within the range of independent post-tax WACC estimates for regulated energy businesses in New Zealand, after normalising for differences in risk-free rates. For example, our estimate is above Simmons' estimate for Horizon (5.19%), above PwC's estimates for Vector and Horizon (4.99% and 5.19%), and above Forsyth Barr's estimate for Transpower (4.79%), but below Northington Partner's and First NZ Capital's estimates for Transpower (5.45% and 5.69%) and below broker estimates for Vector's entire business including unregulated activities (ranging from 5.56% to 7.15%, with an average of 6.19%);[362] and

574.3 similar to recent regulatory WACC decisions made by the AER in Australia (with averages of 5.17% for electricity distribution, 5.26% for electricity transmission, 5.21% for gas distribution, and 5.44% for gas transmission, after normalising for differences in risk-free rates), and above recent decisions

[361] See paragraphs 611 to 630 for further discussion on RAB multiples.

[362] As explained in paragraph 588, the post-tax WACC for regulated electricity distribution and gas pipeline services is expected to be lower than for the other services provided by Vector.

made by Ofgem in the UK (4.41% for electricity distribution, 4.72% for electricity transmission, 4.39% for gas distribution, and 4.53% for gas transmission, after normalising for differences in risk-free rates).

575. We have assessed the reasonableness of our airports WACC estimate based on our mid-point estimate. This reflects our proposal to publish only 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 6.17% (as at 1 April 2016) is reasonable given it is:

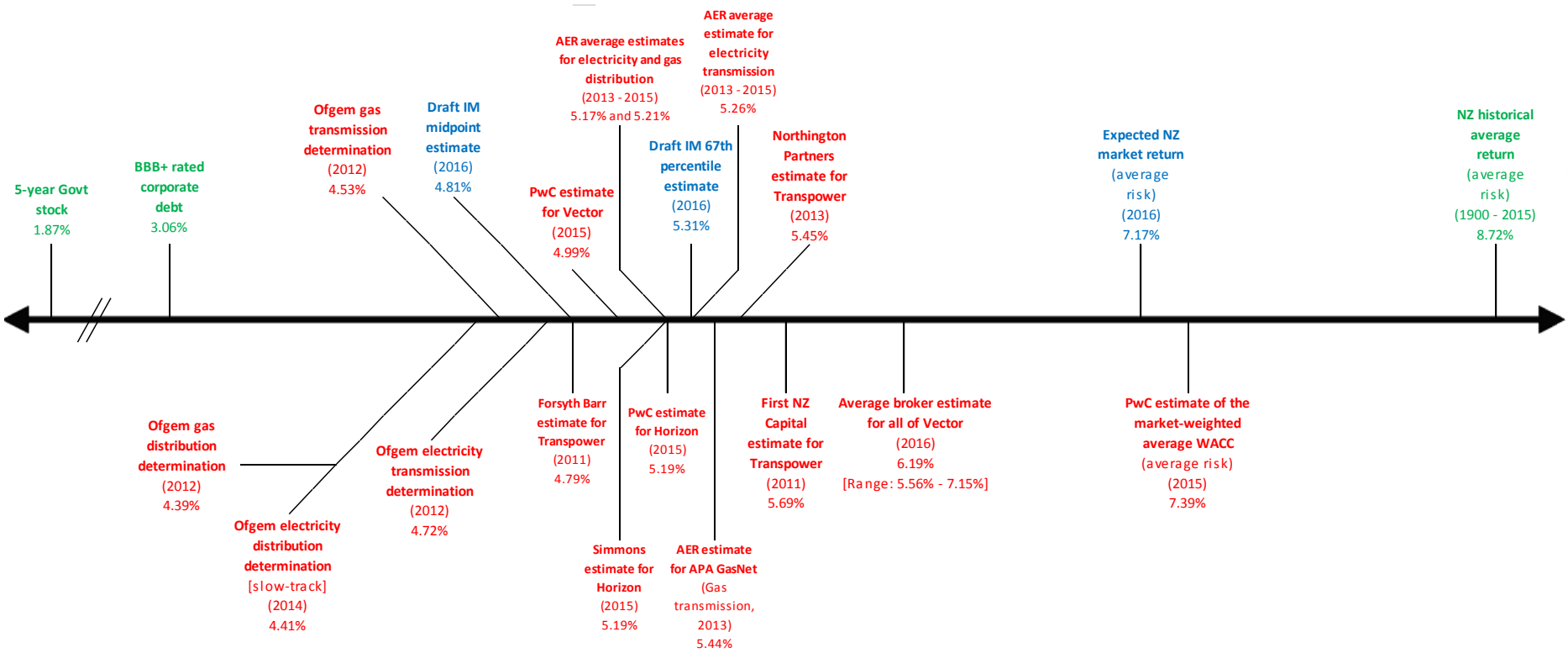
575.1 below the long-term historical (8.72%) and the forecast return on New Zealand investments of average risk (7.17%-7.39%), but well above the post-tax returns on five-year government stock (1.87%) and five-year A- bonds (2.88%). This is consistent with expectations regulated airport services face lower risks than the average New Zealand firm, but greater risks relative to corporate bonds and government stock;

575.2 similar to alternative New Zealand sourced post-tax WACC estimates for airports, after normalising for differences in risk-free rates. For example, our estimate is the same as Deutsche Bank's estimate for the regulated segment of Auckland International Airport's (AIAL) business (6.17%), within the range of broker estimates for AIAL's entire business (ranging from 5.71% to 6.67%, with an average of 6.33%), but below the post-tax WACC of 6.28% that Dunedin International Airport used for its 2014 disclosure year, below PwC's estimate for Queenstown Airport's aeronautical business of 6.86%, and below PwC's estimate for AIAL's entire business (including unregulated activities) of 6.99%;[363] and

575.3 within the range of recent overseas regulatory WACC decisions for airports (after normalising for differences in risk-free rates), made by the CAA in the UK (6.11% for Heathrow and 6.42% for Gatwick) and the Commission for Aviation Regulation (**CAR**) in Ireland (6.09% for Dublin Airport).

[363] AIAL has previously acknowledged that its unregulated services would be expected to have a higher post-tax WACC than its regulated services. Auckland International Airport Limited "Airport regulation and pricing - Issues Brief" (November 2006), p.5.

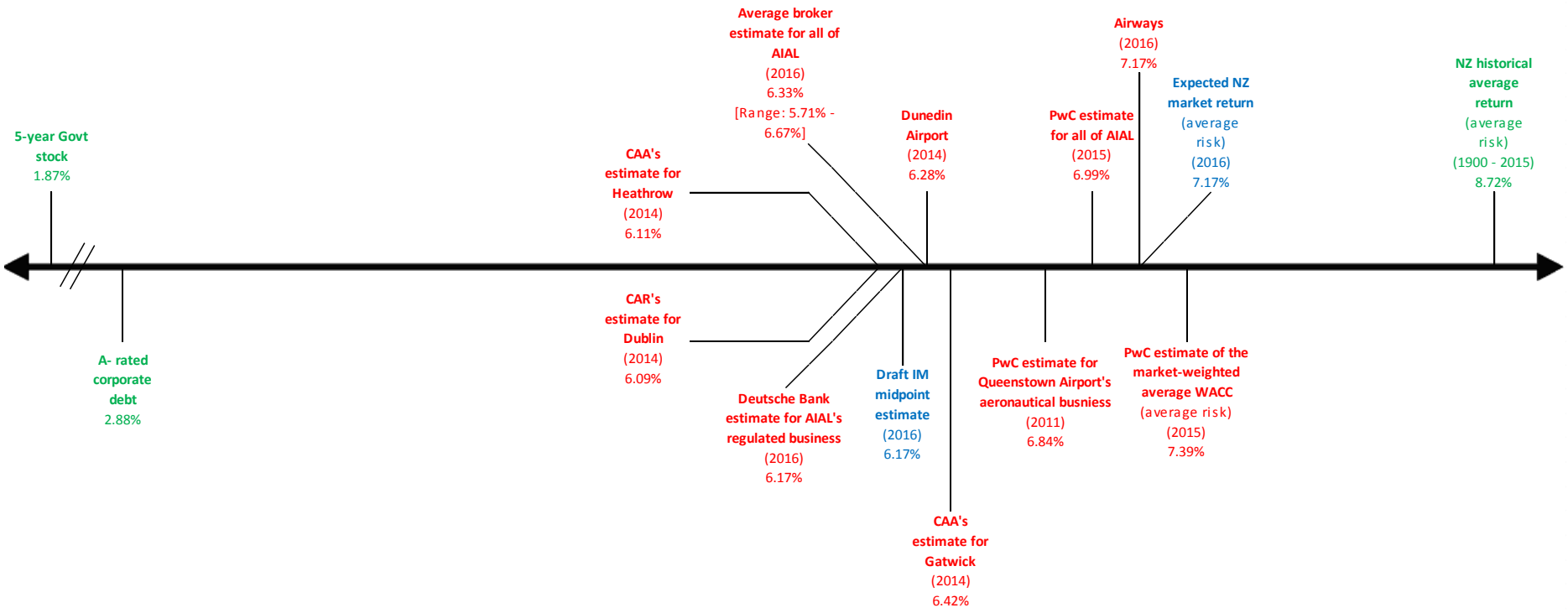
Figure 10: Summary of WACC reasonableness checks for EDBs, Transpower, and GPBs (using normalised risk-free rates)



Estimates made by the Commission 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.

As noted in paragraph 566, 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 a number of country-specific factors (such as differences in tax regimes, monetary conditions, regulatory regimes, and investors' relative risk aversion).

Figure 11: Summary of WACC reasonableness checks for airports (using normalised risk-free rates)



Estimates made by the Commission 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.

As noted in paragraph 566 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 a number of country-specific factors (such as differences in tax regimes, monetary conditions, regulatory regimes, and investors' relative risk aversion).

576. We have given particular attention to the reasonableness of our 67th percentile WACC estimate for gas pipeline services, given our proposal to no longer apply a higher asset beta for GPBs (relative to EDBs and Transpower). Although limited evidence is available to test the reasonableness of our WACC estimate for GPBs, we note that:

576.1 the AER and Ofgem generally use the same, or very similar, asset beta and WACC estimates for electricity lines and gas pipeline businesses. This is consistent with our findings in 2010, where we noted that the available evidence suggested a similar WACC would normally be assumed for GPBs and EDBs (and therefore, our approach of applying an asset beta uplift for gas "may be considered favourable to GPBs");[364] and

576.2 the observed RAB multiples for the recent sales of Vector and Maui's gas businesses to First State Funds suggest that the current regulatory settings are sufficient to compensate investors for putting their capital at risk.[365] In particular, RAB multiples for the Vector sale are significantly above one, even after adjusting for the expected impact of reducing the asset beta for GPBs from 0.44 to 0.34.[366]

577. More details on the reasonableness checks we have undertaken for EDBs/Transpower/GPBs and airports (respectively) are included below.

Further detail on reasonableness checks for EDBs, Transpower, and GPBs

578. This section explains the comparative information used when assessing the reasonableness of our WACC estimate for EDBs, Transpower and GPBs in more detail. A summary of the information considered is contained in Figure 10.

Our WACC estimate for EDBs, Transpower and GPBs as at 1 April 2016

579. Our WACC estimate for EDBs, Transpower and GPBs calculated using the draft amended cost of capital IM is shown in Table 17. The figures are based on the draft cost of capital IMs contained in this decision. The risk-free rate and debt premium are calculated as at 1 April 2016.

364 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), paragraph H13.71-H13.74.

365 See paragraphs 611 to 630 for further discussion on RAB multiples.

366 Specifically, the RAB multiples reported for the Vector sale range from 1.33x to 1.50x (or 1.17x to 1.32x, after adjusting for the expected impact of reducing the asset beta for GPBs). We have estimated a RAB multiple for the Maui sale of 1.14x (or 1.00x, after adjusting for the expected impact of reducing the asset beta).

Table 17: WACC estimate for EDBs, Transpower and GPBs as at 1 April 2016

Parameter	Estimate	Standard error
Risk-free rate	2.60%	
Debt premium	1.65%	0.0015
Leverage	41%	
Asset beta	0.34	0.14
Debt beta	0.00	
TAMRP	7.0%	0.015
Corporate tax rate	28.0%	
Investor tax rate	28.0%	
Debt issuance costs	0.20%	
Equity beta	0.58	
Cost of equity	5.93%	
Cost of debt	4.45%	
Vanilla WACC (mid-point)	**5.32%**	0.0113
Vanilla WACC (67th percentile)	**5.82%**	
Post-tax WACC (mid-point)	**4.81%**	0.0113
Post-tax WACC (67th percentile)	**5.31%**	

580. As noted in paragraph 574 above, our reasonableness checks analysis focusses on our 67th percentile post-tax WACC estimate for EDBs, Transpower and GPBs of 5.31%. We consider it appropriate to focus on the 67th percentile estimate, given that this is the WACC estimate used when setting price-quality paths for EDBs, Transpower and GPBs.

The plausible range

581. Our 67th percentile post-tax WACC estimate for EDBs, Transpower and GPBs of 5.31% is comfortably within the plausible range we have considered, which is bounded:

581.1 at the lower end, by post-tax yields on five-year Government stock of 1.87% and five-year BBB+ rated corporate debt of 3.06%; and

581.2 at the upper end, by the future return expected from the New Zealand market for a firm of average risk of 7.17% (which we have estimated using the CAPM), the market average WACC for New Zealand reported by PwC (normalised to reflect our risk-free rate) of 7.39%, and historical average returns on the New Zealand market of 8.72% (as reported by Dimson, Marsh, and Staunton).

582. Our WACC estimate for EDBs, Transpower and GPBs is 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 quintessential low risk businesses. Therefore, equity investors would expect to earn a lower return on these businesses than a New Zealand company of average risk.

583. We have estimated a future return expected from the market (using the simplified Brennan-Lally CAPM) of 7.17%, as at 1 April 2016. By definition, the market has an average equity beta of 1. Our analysis also assumes a TAMRP of 7%, market-wide leverage of 30%, a risk-free rate of 2.60%, a debt premium of 1.65%, debt issuance costs of 0.20% per annum and a corporate and investor tax rate of 28%.[367]

584. PwC's most recent estimate of the market-weighted average post-tax WACC for around 100 New Zealand listed companies is 8.4%.[368] This results in a market average WACC of 7.39%, when adjusting for our risk-free rate of 2.60% (instead of PwC's risk-free rate of 4.00%).

585. We have estimated the historical average return for the New Zealand market from 1900-2015 as 8.72%, based on data from Dimson, Marsh and Staunton.[369] 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.[370] The advantage of looking at historic returns is that they can be calculated without the need for an analytical tool such as CAPM.

NZ-sourced estimates of the cost of capital for regulated suppliers

586. As part of our reasonableness checks, we have considered independent post-tax WACC estimates for New Zealand electricity lines and gas pipeline businesses. The estimates, which are summarised in Table 18, have been sourced from:

586.1 Simmons;[371]

586.2 Northington Partners;[372]

586.3 Forsyth Barr;[373]

586.4 First NZ Capital;[374]

586.5 PwC;[375] and

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367 For simplicity, we have used our BBB+ debt premium estimate when estimating the future return expected from the market.

368 PwC "Appreciating Value New Zealand" (Edition six, March 2015).

369 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 1900-2015. 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.

370 Dimson, Marsh and Staunton, "Credit Suisse Global Investment Returns Yearbook 2016".

371 Simmons Corporate Finance "Horizon Energy Distribution Limited Independent Adviser's Report In Respect of the Full Takeover Offer by Eastern Bay Energy Trust" (June 2015).

372 Northington Partners "Transpower New Zealand – Valuation Assessment" (15 November 2013).

373 Forsyth Barr "Transpower – Capex coming to fruition" (8 November 2011).

374 First NZ Capital "Transpower – A valuation perspective" (31 October 2011).

586.6 research analysis employed by New Zealand investment banks.[376]

Table 18: New Zealand sourced WACC estimates for regulated energy businesses (normalised for differences in risk-free rates)

	Original WACC estimate	Risk-free rate used	Normalised WACC estimate*
Simmons, 2015 (Horizon)	6.20%	4.00%	5.19%
PwC, 2015 (Horizon)	6.20%	4.00%	5.19%
Northington Partners, 2013 (Transpower)	7.00%	4.75%	5.45%
Forsyth Barr, 2011 (Transpower)	7.24%	6.00%	4.79%
First NZ Capital, 2011 (Transpower)	7.60%	5.25%	5.69%
PwC, 2015 (Vector)	6.00%	4.00%	4.99%
Broker estimates, 2016 (Vector)	6.65% to 7.80%	3.00% to 5.00%	5.56% to 7.15%

Note: * The normalised WACC estimates have been calculated by substituting in our risk-free rate estimate (as at 1 April 2016) of 2.60%.

587. After normalising for differences in risk-free rates, our 67th percentile post-tax WACC estimate for EDBs, Transpower and GPBs of 5.31% is within the range of independent estimates. Specifically, our 67th percentile estimate is:

587.1 above the Simmons WACC estimate for Horizon of 5.19%;

587.2 above the PwC WACC estimates for all of Vector and Horizon of 4.99% and 5.19% respectively;

587.3 above the Forsyth Barr WACC estimate for Transpower of 4.79%;

587.4 below the Northington Partners and First NZ Capital estimates for Transpower of 5.45% and 5.69%, respectively; and

587.5 below the range of WACC estimates for all of Vector made by research analysts employed by New Zealand investment banks (5.56% to 7.15%, with an average of 6.19%).

588. As explained in our 2010 IM reasons paper, we would generally expect estimates of Vector's WACC to be above our IM-based WACC estimate for EDBs.[377] This is because estimates of Vector's post-tax WACC cover all of Vector's businesses (including gas, electricity, telecommunications, gas wholesaling, and metering), but the IM focusses

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375 PwC "Appreciating Value New Zealand" (Edition six, March 2015).

376 Craigs Investment Partners, First NZ Capital, Forsyth Barr, Macquarie and UBS were all surveyed in early 2016 regarding their WACC estimates for Vector, and the risk-free rates used in their analysis.

377 Commerce Commission "Input methodologies (Electricity Distribution and Gas Pipeline Services): Reasons Paper" (December 2010), para H13.54.

solely on regulated services (electricity distribution and gas pipeline services). The post-tax WACC for regulated electricity distribution and gas pipeline services is expected to be lower than for the other services provided by Vector, and lower than for the overall company.

Overseas estimates of the regulated cost of capital

589. We have also considered recent regulatory decisions regarding the cost of capital made by the AER in Australia, and Ofgem in the UK. To enable comparison with our 67th percentile post-tax WACC estimate, we have converted:

589.1 the AER's nominal vanilla WACC estimates to post-tax WACC estimates (assuming a tax rate of 30%), and then substituted in our risk-free rate estimate of 2.60%;[378] and

589.2 Ofgem's real vanilla WACC estimates to nominal post-tax WACC estimates (assuming an inflation rate of 2.0% and a tax rate of 20%), and then substituted in our risk-free rate estimate of 2.60%.[379]

590. The AER WACC estimates we have considered are very similar to our 67th percentile estimate for EDBs, Transpower and GPBs of 5.31%, after normalising for differences in the risk-free rate. Based on the AER WACC estimates listed in Table 19, the average WACC for:

590.1 electricity distribution is 5.17%;

590.2 electricity transmission is 5.26%;

590.3 gas distribution is 5.21%; and

590.4 gas transmission is 5.44% (noting that the only estimate included is from the 2013 determination for APA GasNet Australia).

[378] The tax rate of 30% is based on the statutory corporate tax rate.

[379] The tax rate of 20% is based on the statutory corporate tax rate. We have assumed an inflation rate of 2%, based on the Bank of England's inflation target (see http://www.bankofengland.co.uk/monetarypolicy/Pages/framework/framework.aspx).

Table 19: Recent AER WACC determinations (2013-today)

Determination	Year	State	Normalised WACC estimate
Electricity distribution			
Ausgrid	2015	NSW	5.48%
Endeavour Energy	2015	NSW	5.48%
Essential Energy	2015	NSW	5.48%
ActewAGL	2015	ACT	5.27%
Energex	2015	Queensland	4.90%
Ergon	2015	Queensland	4.72%
SA Power Networks	2015	South Australia	4.83%
Average			*5.17%*
Electricity transmission			
ElectraNet	2013	South Australia	5.49%
Murraylink	2013	Interconnector (V-SA)	5.48%
SP AusNet	2014	Victoria	5.19%
Directlink	2015	Interconnector (Q-NSW)	4.61%
TransGrid	2014	NSW	5.52%
Average			*5.26%*
Gas distribution			
SP AusNet	2013	Victoria	5.40%
Envestra (Victoria)	2013	Victoria	5.35%
Multinet Gas	2013	Victoria	5.38%
Envestra (Albury)	2013	Victoria	5.35%
Jemena	2015	NSW	4.59%
Average			*5.21%*
Gas transmission			
APA GasNet Australia (Operations)	2013	Victoria	5.44%

591. As shown in Table 20, recent Ofgem WACC estimates for electricity distribution, electricity transmission, gas distribution, and gas transmission, are below our 67th percentile WACC estimates for EDBs, Transpower and GPBs of 5.31% (after normalising for difference in risk-free rates).[380]

[380] Ofgem "RIIO-ED1: Final determinations for the slowtrack electricity distribution companies - Overview - Final decision" (28 November 2014); Ofgem "RIIO-GD1: Final Proposals - Finance and uncertainty supporting document" (17 December 2012); and Ofgem "RIIO-T1: Final Proposals for National Grid Electricity Transmission and National Grid Gas – Finance Supporting document" (17 December 2012).

Table 20: Recent Ofgem WACC determinations

Determination	Year	Normalised WACC estimate
RIIO-ED1 - electricity distribution (slow-track)	2014	4.41%
RIIO-T1 - electricity transmission	2012	4.72%
RIIO-GD1 - gas distribution	2012	4.39%
RIIO-T1 - gas transmission	2012	4.53%

Reasonableness of GPB WACC estimate

592. In the 2010 IMs, we adopted a higher asset beta for GPBs than EDBs and Transpower, leading to a higher post-tax WACC estimate for gas pipeline services. This reflected our view that New Zealand GPBs were likely to face greater exposure to systematic risk than suppliers of electricity lines services.[381]

593. As explained in the asset beta section above, we propose that the same asset beta (and the same WACC) should now be used for EDBs, Transpower, and GPBs.[382] This reflects updated analysis suggesting that the upwards adjustment we made to the asset beta for GPBs in 2010 should no longer be applied.

594. The reasonableness checks we have undertaken support using the same WACC estimate for EDBs, Transpower, and GPBs. In particular, we note that:

    594.1 the AER and Ofgem generally use the same, or very similar, asset beta and WACC estimates for electricity lines and gas pipeline businesses. This is consistent with our findings in 2010, where we noted that the available evidence suggested a similar WACC would normally be assumed for GPBs and EDBs;[383] and

    594.2 the observed RAB multiples for the recent sales of Vector and Maui's gas businesses to First State Funds suggest that the current regulatory settings are sufficient to compensate investors for putting their capital at risk. In particular, RAB multiples for the Vector sale are significantly above one, even after adjusting for the expected impact of reducing the asset beta for GPBs from 0.44 to 0.34.[384]

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381 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), para H13.72.

382 See paras 331 to 391.

383 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), para H13.72.

384 Specifically, the RAB multiples reported for the Vector sale range from 1.33x to 1.50x (or 1.17x to 1.32x, after adjusting for the expected impact of reducing the asset beta for GPBs). We have estimated a RAB

Further details on reasonableness checks for airports

595. 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 in contained in Figure 11.

Our WACC estimate for specified airport services as at 1 April 2016

596. Our WACC estimate for airports is shown in Table 21. The figures are based on the draft cost of capital IMs contained in this decision. The risk-free rate and debt premium are calculated as at 1 April 2016.

Table 21: WACC estimate for airports as at 1 April 2016

Parameter	Estimate	Standard error
Risk-free rate	2.60%	
Debt premium	1.40%	0.0015
Leverage	19%	
Asset beta	0.58	0.16
Debt beta	0.00	
TAMRP	7.0%	0.015
Corporate tax rate	28.0%	
Investor tax rate	28.0%	
Debt issuance costs	0.20%	
Equity beta	0.72	
Cost of equity	6.91%	
Cost of debt	4.20%	
Vanilla WACC (mid-point)	**6.40%**	0.0144
Post-tax WACC (mid-point)	**6.17%**	0.0144

597. As noted in paragraph 574.1 above, our reasonableness checks analysis focusses on our mid-point post-tax WACC estimate for airports of 6.17%. This reflects our proposal to only publish mid-point WACC estimates for airports (along with the standard error of the WACC, which can be used to calculate different percentile estimates).

The plausible range

598. Our mid-point post-tax WACC estimate for airports of 6.17% is comfortably within the plausible range we have considered, which is bounded:

598.1 at the lower end, by post-tax yields on five-year Government stock of 1.87% and five-year A- rated corporate debt of 2.88%; and

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multiple for the Maui sale of 1.14x (or 1.00x, after adjusting for the expected impact of reducing the asset beta).See paragraphs 611 to 630 for further details.

598.2 at the upper end, by the future return expected from the New Zealand market for a firm of average risk of 7.17% (which we have estimated using the CAPM), the market average WACC for New Zealand reported by PwC (normalised to reflect our risk-free rate) of 7.39%, and historical average returns on the New Zealand market of 8.72% (as reported by Dimson, Marsh, and Staunton).

599. 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).[385]

600. We have estimated a future return expected from the market (using the simplified Brennan-Lally CAPM) of 7.17%, as at 1 April 2016. By definition, the market has an average equity beta of 1. Our analysis also assumes a TAMRP of 7%, market-wide leverage of 30%, a risk-free rate of 2.60%, a debt premium of 1.65%, debt issuance costs of 0.20% per annum and a corporate and investor tax rate of 28%.[386]

601. PwC's most recent estimate of the market-weighted average post-tax WACC for around 100 New Zealand listed companies is 8.4%.[387] This results in a market average WACC of 7.39%, when adjusting for our risk-free rate of 2.60% (instead of PwC's risk-free rate of 4.00%).

602. We have estimated the historical average return for the New Zealand market from 1900-2015 as 8.72%, based on data from Dimson, Marsh and Staunton.[388] 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.[389] The advantage of looking at historic returns is that they can be calculated without the need for an analytical tool such as CAPM.

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385 The High Court appeared to agree with this assessment in the IMs merits appeals judgement, noting that "…it is the aeronautical aspects of AIAL's business that are regulated services, being ones provided in markets regulated under Part 4. It is something of a truism to observe that investors' risks in such markets are generally considered to be lower than in more competitive markets". *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1218].

386 For simplicity, we have used our BBB+ debt premium estimate when estimating the future return expected from the market.

387 PwC "Appreciating Value New Zealand" (Edition six, March 2015).

388 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 1900-2015. 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.

389 Dimson, Marsh and Staunton, "Credit Suisse Global Investment Returns Yearbook 2016".

NZ-sourced estimates of the cost of capital for regulated suppliers and similar businesses

603. As part of our reasonableness checks, we have considered alternative post-tax WACC estimates for New Zealand airports and similar businesses. The estimates, which are summarised in Table 18, have been sourced from:

603.1 Deutsche Bank;[390]

603.2 Dunedin Airport;[391]

603.3 PwC;[392]

603.4 research analysis employed by New Zealand investment banks;[393] and

603.5 Airways NZ.[394]

Table 22: New Zealand sourced WACC estimates for airports (normalised for differences in risk-free rates)

	Original WACC estimate	Risk-free rate used	Normalised WACC estimate*
Deutsche Bank, 2016 (AIAL regulated only)	7.47%	4.40%	6.17%
Dunedin Airport (2014 financial disclosure)	6.87%	3.42%	6.28%
PwC, 2011 (Queenstown Airport aeronautical)	8.50%	4.90%	6.84%
PwC, 2015 (AIAL)	8.00%	4.00%	6.99%
Broker estimates, 2016 (AIAL)	6.00% to 8.40%	3.00% to 5.00%	5.71% to 6.67%
Airways NZ (May 2016)	6.90%	2.23%	7.17%

Note: * The normalised WACC estimates have been calculated by substituting in our risk-free rate estimate (as at 1 April 2016) of 2.60%.

604. After normalising for differences in risk-free rates, our mid-point percentile post-tax WACC estimate for airports of 6.17% is similar to alternative New Zealand sourced estimates. Specifically, our mid-point estimate is:

604.1 the same as the Deutsche Bank estimate for the regulated segment of AIAL's business of 6.17%;

390 Deutsche Bank "Markets Research – Auckland Int. Airport" (19 February 2016).

391 Dunedin International Airport Limited "2014 Disclosure Financial Statements" (27 November 2014).

392 PwC "Appreciating Value New Zealand" (Edition six, March 2015); and PwC "Queenstown Lakes District Council – Issue of shares in Queenstown Airport Corporation Limited to Auckland International Airport Limited – Detailed report on fairness opinion" (15 March 2011).

393 Craigs Investment Partners, First NZ Capital, Macquarie and UBS were all surveyed in early 2016 regarding their WACC estimates for AIAL, and the risk-free rates used in their analysis.

394 Airways New Zealand Ltd "Airways' pricing for the 2016-2019 period: Consultation response document" (May 2016), p.30.

604.2 below the post-tax WACC of 6.28% that Dunedin International Airport used for its 2014 disclosure year;

604.3 below the PwC estimate for Queenstown Airport's aeronautical business of 6.84%;[395]

604.4 below the PwC estimate for AIAL's entire business of 6.99%;

604.5 within the range of WACC estimates for AIAL's entire business made by research analysts employed by New Zealand investment banks (5.71% to 6.67%, with an average of 6.33%); and

604.6 below the Airways NZ WACC estimate of 7.17%, based on its pricing for the 2016-2019 period.

605. We would generally expect estimates of AIAL's WACC to be above our IM-based WACC estimate for specified airport services. This is because estimates of AIAL's post-tax WACC cover its entire business (including retail stores, car parking, property etc), but the IM focusses solely on regulated airport services (ie, aeronautical activities). We note that:

605.1 Deutsche Bank has estimated a WACC for AIAL's regulated business that is lower than for AIAL Group;[396]

605.2 in a 2011 report regarding the sale of shares in Queenstown Airport to AIAL, PwC stated that "In our view, the asset beta for the commercial business should not be less than the asset beta for the aeronautical business. The commercial assets have some but not all of the natural monopoly characteristics of the aeronautical assets". Specifically, PwC used an asset beta of 0.6 for the aeronautical business, and a range of 0.6-0.8 for the commercial business;[397] and

605.3 AIAL has previously acknowledged that its unregulated services would be expected to have a higher post-tax WACC than its regulated services.[398]

606. We note that Dunedin International Airport's post-tax WACC estimate for its airport activities (6.28%) is calculated using many of the same parameter values as the 2010

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395 We have used the mid-point of the WACC range from 7.8%-9.2% (and mid-point of the risk-free rate range from 3.9%-5.9%), based on an asset beta of 0.6 (given that PwC notes it considers an asset beta of 0.6 is appropriate for the aeronautical business). PwC "Queenstown Lakes District Council – Issue of shares in Queenstown Airport Corporation Limited to Auckland International Airport Limited – Detailed report on fairness opinion" (15 March 2011), Table 11 and Appendix J.

396 Deutsche Bank "Markets Research – Auckland Int. Airport" (19 February 2016), p.13.

397 PwC "Queenstown Lakes District Council – Issue of shares in Queenstown Airport Corporation Limited to Auckland International Airport Limited – Detailed report on fairness opinion" (15 March 2011), p.74.

398 Auckland International Airport Limited "Airport regulation and pricing - Issues Brief" (November 2006), p.5.

IMs (eg, asset beta of 0.60, TAMRP of 7%, and leverage of 17%), and that these are similar to the values contained in the draft amended cost of capital IM. We consider that this supports the reasonableness of our estimate, given that Dunedin Airport is an unregulated business, and so is free to use alternative values if it considers our approach does not produce a commercially realistic WACC estimate.

607. Airways NZ's pricing for the 2016-2019 period, which was finalised in May 2016, is based on a post-tax WACC of 7.17% (after adjusting for our risk-free rate). Airways NZ, through its Air Navigation Service (**ANS**), is a self-regulated monopoly provider of essential air transportation services.

608. However, we have placed limited weight on the Airways NZ estimate. We note that:

608.1 although Airways NZ states that its proposed WACC is based on our current IMs, it has used leverage of 40%. This is inconsistent with our approach to the leverage anomaly (of using the average leverage for our asset beta comparator sample), and will result in a higher WACC estimate. (The Airways NZ estimate of 7.17% is also based on the 67th percentile, while our estimate of 6.17% is based on the mid-point); and

608.2 the High Court previously questioned the value of Airways NZ's self-estimates as a reasonableness check for our airports WACC estimate.[399]

Overseas estimates of the regulated cost of capital

609. We have also considered recent regulatory decisions regarding the cost of capital for airports made by the CAA in the UK, and the CAR in Ireland.[400] To enable comparison with our mid-point post-tax WACC estimate, we have converted:

609.1 the CAA's real pre-tax WACC estimates to nominal post-tax WACC estimates (assuming an inflation rate of 3.0% and a tax rate of 20.2%), and then substituted in our risk-free rate estimate of 2.60%;[401] and

609.2 the CAR's real pre-tax WACC estimate to a nominal post-tax WACC estimate (assuming an inflation rate of 2.0% and a tax rate of 12.5%), and then substituted in our risk-free rate estimate of 2.60%.[402]

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399 The High Court stated "We are not persuaded that Airways Corporation NZ's self-estimate for its self-regulating air navigation services business is particularly helpful". *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1212].

400 CAA "Estimating the cost of capital: technical appendix for the economic regulation of Heathrow and Gatwick from April 2014: Notices granting the licences" (February 2014); and CAR "Maximum level of airport charges at Dublin Airport 2014 determination" (7 October 2014).

401 The CAA refers to a tax rate of 20.2% in its decision, and notes that it used an inflation rate of 3% when undertaking analysis in the final proposals. CAA "Estimating the cost of capital: technical appendix for the economic regulation of Heathrow and Gatwick from April 2014: Notices granting the licences" (February 2014), figure 7.1 and para 5.30.

610. As shown in Table 23, our mid-point WACC estimate for airports of 6.17% is within the range of the CAA and CAR estimates (after normalising for differences in risk-free rates).

Table 23: Overseas regulatory WACC estimates for airports

Determination	Year	Normalised WACC estimate
CAA estimate for Heathrow	2014	6.11%
CAA estimate for Gatwick	2014	6.42%
CAR estimate for Dublin	2014	6.09%

We have also considered RAB multiples evidence, as an secondary reasonableness check

611. As part of our reasonableness checks, we have considered RAB multiples for regulated energy and airports 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.

612. The RAB multiple of a regulated business is the ratio of its enterprise value to its RAB.[403] The ratio tells us the market value of each dollar of the utility's RAB. For example, a ratio of 1.2 tells us that each $1.00 of RAB is currently valued by the market to be worth $1.20.

613. At its simplest, the concept is that (in the 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 1.0).

614. 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 and other modelling assumptions. On this basis, a RAB multiple of greater than 1.0 could imply either:

614.1 the regulatory allowed rate of return was too high; or

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402 The CAR assumed a tax rate of 12.5% in its determination, based on the main corporate tax rate in Ireland. CAR "Maximum level of airport charges at Dublin Airport 2014 determination" (7 October 2014), para 7.121. We have assumed an inflation rate of 2.0%, based on Central Bank of Ireland's target of maintaining "…inflation rates below, but close to, 2% over the medium term". Central Bank of Ireland "Strategic plan 2016-2018", p.10.

403 The enterprise value is calculated as the sum of the market value of net debt and the market value of the shareholders' equity.

614.2 the market expected the company to outperform cash flow or other model assumptions used in the regulatory determination.

615. We previously considered RAB multiples evidence in our 2014 decision on the amendment to the WACC percentile for price-quality path regulation of electricity lines are gas pipeline services. Further details regarding our approach to estimating RAB multiples, how RAB multiples have been used in other jurisdictions, and limitations of RAB multiples evidence, are contained in that decision.[404]

Summary of RAB multiples evidence we have considered

616. We have considered recent evidence regarding RAB multiples for businesses subject to regulation under Part 4 of the Commerce Act. In particular, RAB multiples are able to be calculated for:

616.1 the sale of Vector's gas transmission assets and gas distribution assets (outside of Auckland) to First State Funds, which was announced in November 2015 (and completed in April 2016);

616.2 the sale of Maui's gas transmission assets to First State Funds, which was announced in December 2015;

616.3 the takeover of 22.71% of shares in Horizon by Eastern Bay Energy Trust in June 2015; and

616.4 regulated businesses that are publicly listed, specifically Vector and AIAL.

617. Given that Vector and AIAL are publicly listed, we have simply reported RAB multiples estimated by research analysts employed by New Zealand investment banks for these companies. For Horizon and Maui, on the other hand, we have estimated RAB multiples ourselves based on publicly available information regarding the recent transactions affecting these companies.

618. The RAB multiples evidence we have considered in summarised in Table 24 and Table 25. Table 24 contains available RAB multiples for EDBs (ie, Vector and Horizon) and AIAL, while Table 25 focuses on the recent sales of Vector and Maui's gas assets to First State Funds.[405]

[404] 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.

[405] We also note the RAB multiples evidence presented in our 2014 WACC percentile decision. 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.

Table 24: Summary of RAB multiples for regulated EDBs and airports[406]

	RAB multiple
Electricity distribution	
Vector - Craigs Investment Partners (Nov 2015)*	1.26x
Vector - Macquarie (Nov 2015)	1.43x
Horizon - Commerce Commission estimate (June 2015)**	1.13x - 1.34x
Airports	
AIAL - Deutsche Bank (Feb 2016)***	1.24x - 1.44x
AIAL - Forsyth Barr (June 2015)	1.40x

Notes: * Based on sum of the parts valuation for electricity lines.

** Upper end of the range includes the value of other net financial obligations, such as deferred taxes, when calculating the enterprise value.

*** Multiple of 1.24x is based on mid-point (P50) WACC. The 75th percentile (P75) implies a RAB multiple of 1.44x.

Table 25: Summary of RAB multiples for recent Vector and Maui gas asset sales[407]

	RAB multiple	RAB multiple (adjusted for reduced beta)*
Vector sale of gas assets to First State Funds		
Craigs Investment Partners (Nov 2015)**	1.33x	1.17x
Macquarie (Nov 2015)	1.47x	1.29x
First NZ Capital (Nov 2015)***	1.4x - 1.5x	1.23x - 1.32x
Maui sale of gas assets to First State Funds		
Commerce Commission estimate (Dec 2015)	1.14x	1.00x

Notes: * The RAB multiples in this column reflect the impact that may be expected from our proposal to remove the gas asset beta uplift. This reduces the post-tax WACC by approximately 12% (from 6.04% to 5.31%), and the return on capital by approximately 12%. Therefore, holding other factors constant, we expect this would reduce the observed RAB multiples for gas pipelines by approximately 12%.

406 Sources for broker RAB multiples estimates: Craigs Investment Partners "Vector – Recycling assets at a premium" (9 November 2015); Macquarie "Vector – Pivot to Auckland and Australia" (9 November 2015); Deutsche Bank "Auckland Int. Airport – Excellent 1H16, regulatory red light" (19 February 2016); and Forsyth Barr "Auckland Airport – Pssst…. PS3 is a Problem" (16 June 2015).

407 Sources for broker RAB multiples estimates: Craigs Investment Partners "Vector – Recycling assets at a premium" (9 November 2015); Macquarie "Vector – Pivot to Auckland and Australia" (9 November 2015); and First NZ Capital "Vector - Gas asset sale value broadly as expected" (9 November 2015).

** Assumes the RAB for the assets sold is $652m, and that 10% of the sale price is due to unregulated income.

*** Depends on the split between the Auckland and non-Auckland RAB for gas distribution. First NZ Capital assumes approximately two-thirds of the gas distribution RAB is allocated to Auckland.

619. We consider that the available RAB multiples for electricity lines and airports (as shown in Table 24 above) support 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 sufficient to compensate investors for putting their capital at risk. This conclusion is likely to hold under our draft amended cost of capital IM, given that we are not proposing to make material changes to our approach to estimating WACC for these sectors.

620. Regarding our proposal to only publish a mid-point WACC estimate (and standard error) for airports, we note that Deutsche Bank has estimated a RAB multiple for AIAL based on the mid-point WACC of 1.24x (compared to 1.44x at the 75th percentile). This supports our conclusion that the mid-point WACC estimate for airports is reasonable.

621. We have paid particular attention to the RAB multiples for sale of Vector and Maui's gas assets (as shown in Table 25), given:

621.1 our proposal to use the same asset beta for electricity lines and gas pipelines, instead of applying an upwards adjustment for GPBs of 0.1 (as we did in 2010);[408] and

621.2 the lack of independent New Zealand sourced WACC estimates to assess the reasonableness of our WACC estimate for GPBs.

622. The observed multiples for the Vector and Maui gas sales support the reasonableness of our WACC estimate for GPBs. The observed multiples are all equal to or above one, even after adjusting for the expected impact of reducing the asset beta for GPBs from 0.44 to 0.34. This suggests that the current regulatory settings are sufficient to compensate investors for putting their capital at risk (even after allowing for the expected impact of reducing the asset beta for GPBs).

622.1 The available RAB multiples for the Vector gas sale, in particular, imply that the regime is offering expected returns that are greater than our view of a normal return. The RAB multiples for the Vector sale are significantly above one, ranging from 1.33x to 1.50x (or 1.17x to 1.32x, after adjusting for the expected impact of reducing the asset beta for GPBs).

622.2 Although the RAB multiples for the Maui sale are lower than for Vector, they are still in excess of one. We have estimated a RAB multiple for the Maui sale

[408] Based on this proposal, the asset beta for GPBs would decrease from 0.44 to 0.34.

of 1.14x (or 1.00x, after adjusting for the expected impact of reducing the asset beta for GPBs).

622.3 We note that the Maui sale occurred after the Vector sale, which may have impacted the sales process (by potentially reducing the level of competition for the Maui assets).

623. While RAB multiples in excess of one could be explained by several reasons, differing views regarding the rate of return required by investors is one obvious potential factor. The presence of such RAB multiples greater than one is not, in our view, a justification for reducing our WACC estimate for GPBs. However, the available evidence suggests our best estimate of WACC for GPBs (based on an asset beta of 0.34) generates at least a normal rate of return.

624. We acknowledge that there are limitations of our RAB multiples analysis. For example, as noted in our 2014 WACC percentile decision:[409]

624.1 there are only a limited number of data points available;

624.2 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

624.3 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.

625. 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). As noted in paragraph 621, we consider that the available RAB multiples for GPBs are useful, given the lack of other New Zealand sourced information available to assess the reasonableness of our WACC estimate for this sector. We welcome any further information to test the reasonableness of our WACC estimates.

How we estimated the RAB multiples for Horizon and Maui

626. We have estimated the RAB multiples for Horizon and Maui based on publicly available information regarding the recent transactions affecting these businesses. The RAB multiples we have reported for Vector and AIAL, on the other hand, are estimates from research analysts employed by New Zealand investment banks.[410]

627. Table 26 summarises our RAB multiples calculations for Horizon. We have estimated both standard and adjusted RAB multiples. The difference is that the adjusted

[409] 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.

[410] The source documents are listed in footnotes 406 and 407. Given that Horizon and Maui are not publicly listed, no broker RAB multiples estimates are available for these companies.

calculation also includes other net financial obligations, such as deferred taxes, when calculating the enterprise value.

Table 26: Horizon RAB multiple

	Measurement date	RAB multiple (standard)	RAB multiple (adjusted for other net financial obligations)[411]
Enterprise value of regulated utility ($m)			
Equity value implied by sale price	June 2015	110.2	110.2
Plus: net debt	March 2015	44.3	44.3
Plus: other net obligations	March 2015	-	24.0
Less: value of unregulated businesses	June 2015	25.0	25.0
Less: capital work in progress	March 2015	1.6	1.6
Total		127.9	151.9
RAB ($m)	March 2015	113.3	113.3
EV / RAB		**1.13x**	**1.34x**

Source: Publicly available information and Commerce Commission analysis

628. The RAB multiples we have estimated for Horizon are based on the assumptions set out below.

628.1 The price paid by Eastern Bay Energy Trust implies a value of $110.2m for 100% of Horizon's equity.[412]

628.2 Horizon had net debt of $44.3m as at March 2015.[413]

628.3 Horizon had other net financial obligations of $24.0m as at March 2015.[414]

628.4 Horizon's unregulated contracting business is valued at $25m. This is based on the mid-point of the Simmons Corporate Finance estimate (from $23m to $27m).[415]

411 The adjusted RAB multiple includes the value of other net financial obligations, such as deferred taxes. For further discussion see: 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.

412 On 5 June 2015 it was announced that Horizon had received a takeover notice from the trustees of Eastern Bay Energy Trust (who already owned 77.29% of Horizon's shares). The takeover, which went unconditional on 29 June 2015, involved Eastern Bay Energy Trust purchasing the remaining 5,675,255 shares it did not already own, at a price of $4.41 per share.

413 Net debt is calculated as "Non-Current Portion of Bank Loans" less "Cash and Cash Equivalents". See: Horizon "Annual report for the year ended 31 March 2015", p.2.

414 Other net financial obligations is calculated as "Deferred Tax Liabilities" plus current and non-current "Derivative Financial Instruments". See Horizon "Annual report for the year ended 31 March 2015", p.2.

415 Simmons prepared an independent adviser's report regarding the takeover. Simmons "Horizon Energy Distribution Limited - Independent Adviser's Report - In Respect of the Full Takeover Offer by Eastern Bay Energy Trust" (June 2015), p.42.

628.5 We have removed capital works in progress of $1.6m from the enterprise value for the regulated business, given that RAB values do not include capital work in progress (ie, assets are only included in RAB once they are commissioned).

628.6 Horizon's closing RAB as at March 2015 is $113.3m.[416]

629. Table 27 summarises our RAB multiple calculations for Maui. The RAB multiple calculation for Maui is simpler than for Horizon, given we understand that there is no debt (or other net financial obligations) to be included when estimating the enterprise value.[417]

Table 27: Maui RAB multiple

	Measurement date	RAB multiple (standard)
Enterprise value of regulated utility ($m)		
Enterprise value based on sale price	Dec 2015	335.0
Less: capital work in progress	Dec 2014	3.4
Total		331.6
RAB ($m)	Dec 2014	290.9
EV / RAB		**1.14x**

Source: Publicly available information and Commerce Commission analysis

630. The RAB multiple we have estimated for Maui is based on the assumptions set out below.

630.1 The sale price of $335m is used as the enterprise value for the regulated business.[418] We have assumed there are no unregulated businesses to be subtracted.

630.2 We have removed capital works in progress of $3.4m 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).

630.3 Maui's closing RAB as at December 2014 was $290.0m.[419] This is the most up-to-date RAB value currently available for Maui, although we note it is measured approximately one year prior to the announcement of the sale to First State Funds.

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416 Horizon "Information Disclosure Reports prepared according to Part 4 of the Commerce Act 1986 For the Year Ended 31 March 2015".

417 We understand that Maui is a joint venture, so only consists of operating assets.

418 In December 2015 it was announced that First State Funds would purchase Maui for $335m. http://www.shell.co.nz/aboutshell/media-centre/news-and-media-releases/2015/mining-companies-sell-north-island-pipeline.html.

419 Maui "Annual disclosures for the disclosure year ending 31 December 2014" (June 2015).

Black's simple discounting rule

631. BSDR has been proposed by MEUG as an alternative method from which we might estimate a benchmark return. The rule has been raised as an alternative method (ie, compared to a CAPM approach) to consider the appropriate return applied to a regulated business.

Issues raised with the current approach

632. The current CAPM methodology is known to have limitations in estimating the appropriate risk-adjusted return. IWA (on behalf of MEUG) proposed an alternative method from which to assess the appropriateness of our estimate of the cost of capital of regulated businesses subject to price-quality regulation.[420]

633. The submission does not directly specify how the BSDR might be incorporated into the IMs, but instead suggests that it could be used as a cross-check.

Background to Black's simple discounting rule

634. Frontier (on behalf of Transpower) explain how BSDR values an asset by estimating future 'certainty equivalent' cash flows and discounting them using a risk-free rate.[421] In contrast, the standard approach estimates 'expected' cash flows and the present value is determined by discounting using a risk-adjusted discount rate (ie, the WACC). Using consistent input assumptions, the two methods will result in the same answer.

635. Although the methods are equivalent, the two methods make use of different input estimates. The standard approach requires an estimate of expected cash flows and a risk-adjusted discount rate, while the certainty equivalent approach requires an estimate of 'certainty equivalent' cash flows.

636. The IWA submission appears to suggest that by comparing the valuation of future cash flows using the two different approaches, we can make judgments about the suitability of the WACC. For example, if the value of cash flows based on the certainty equivalent approach was significantly lower than the value estimated from using the standard approach, then it might suggest that the WACC being used was higher than required by an investor, given the riskiness of returns.

637. However, this conclusion would only be valid if we had greater confidence in our estimate of certainty equivalent cash flows than the estimate of the WACC. The BSDR provides a method for estimating the certainty equivalent cash flows and so its

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420 Ireland, Wallace & Associates Limited's submission on the problem definition paper "Input methodology review – "Black's simple discount rule" – A cross check on the IM cost of capital" (report prepared for MEUG, 19 August 2015).

421 A 'certainty equivalent' cash flow is such that investors would be indifferent between receiving that cash flow *for sure* or receiving the 'expected' cashflow that has some risk associated with it. Frontier Economics "Cost of equity issues related to input methodologies review" (report prepared for Transpower, February 2016), p.71-72.

usefulness as a cross-check on the WACC depends on the accuracy of estimating the certainty equivalent cash flows (compared to the WACC).

638. The suggested approach for estimating these cash flows is a 4-step process described by IWA in reference to a paper by Loderer.[422] Broadly speaking this process can be described as:

638.1 find a benchmark security or index that closely correlates with the project's cash flows;[423]

638.2 estimate the probability that returns of that benchmark security are lower than the risk-free rate between now and the timing of project cash flows;

638.3 obtain information from managers to assess the corresponding percentiles in the cash flow probability distribution (the so-called conditional mean cash flows/certainty equivalent cash flows); and

638.4 discount those cash flows at the risk-free rate.

639. The advantages of the BSDR therefore depend on whether we can more robustly estimate the certainty equivalent cash flows using this process or whether it is more robust to estimate the WACC directly using the CAPM and estimates of asset beta and the TAMRP.

Assessment of Black's simple discounting rule

640. We commissioned advice from Dr Lally on this topic.[424] He considers that BSDR could be applied to regulatory situations but there are some practical difficulties with the four-step process outlined above. In Dr Lally's view the main drawbacks of the application of the approach for regulatory purposes are that:[425]

640.1 The model requires that the output/cash flows of the regulated business are linearly related to the benchmark return and no evidence has been presented that is true.

640.2 A regulator would have to determine the probability distribution of the output/cash flows without assistance from the regulated business because the regulated business would have a vested interest in the result.

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422 Loderer, Long, and Roth "Black's simple discounting tool" (August 2008).

423 The overall market return appears to be the most suitable option for this benchmark. The IWA submission does not provide any potential alternatives.

424 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016), p.28-36.

425 Dr Lally's expert advice on asset beta adjustments and Black's simple discounting rule "Review of WACC issues" (report to the Commerce Commission, 25 February 2016), p.35.

640.3 The process is likely to produce an underestimate of the conditional mean (ie, 'certainty equivalent') cash flows if there is not a close correlation between the benchmark return and the outputs/cash flows.

641. Given these drawbacks Dr Lally does not recommend the use of this approach.

642. Submissions from suppliers provided a similar view to Dr Lally. The ENA summarise their position as:[426]

> Dr Lally has noted the key practical difficulties with implementing Black's Rule in a regulatory context:
>
> - estimating the probability distribution of regulatory cash flows will be very difficult in practice, particularly if potential bias means the ENBs cannot be involved;
> - the relationship between regulatory cash flows and that of the market is unclear, and the linear relationship required does not necessarily hold; and
> - a robust method for estimating the expected cash flows, conditional on the market return equalling the risk-free rate, has not been demonstrated.
>
> The ENA agrees these are substantial challenges. As we stated in our previous submission, it would be difficult to implement Black's Rule in this context. We do not consider that Black's Rule would be a credible addition to the IMs.

643. A further difficulty pointed out by Houston Kemp (on behalf of Powerco) is the complexity in assessing results from the use of the BSDR as a cross-check against the WACC. For example Houston Kemp suggest that:[427]

> Care must be taken in interpreting any difference between the NPVs of these cash flows, because the regulatory WACC enters the estimated NPV of both the expected and certainty equivalent cash flows.

644. IWA do not expand on how they expect the results could be used as a cross-check to the WACC. They submit that the unconditional (or expected) cash flows can be compared with the conditional (or certainty equivalent) cash flows:[428]

> A comparison of the MAR and the related "unconditional" NCFs (NOPAT in this case) incorporating CAPM/WACC at 67th percentile can be compared to "conditional" NCFs estimated using Black's Rule incorporating an implied risk free rate.

645. Both Houston Kemp and CEG suggest that when the certainty equivalent cash flows are much lower than the expected cash flows, it implies that a higher WACC is

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426 ENA "Input methodologies review: Emerging views papers – Submission to the Commerce Commission" (24 March 2016), p.8

427 Houston Kemp's cross submission on the problem definition paper "Comment on select submissions to the Commission's input methodologies review" (report prepared for Powerco, 4 September 2015), p.5.

428 Ireland, Wallace & Associates Limited's submission on the problem definition paper "Input methodology review – "Black's simple discount rule" – A cross check on the IM cost of capital" (report prepared for MEUG, 19 August 2015), para 5.3.

required. CEG submit "The lower the certainty equivalent value as a proportion of the risky cash flow implies the cash-flow is more risky, not less."[429]

646. Using the example for Transpower provided in IWA's report, a difference of $58m between the value of the discounted expected cash flows and the certainty equivalent cash flows can be calculated.[430]

647. Houston Kemp and CEG suggest that if a higher WACC is applied, both the certainty equivalent and expected cash flows would increase (because the WACC increases the allowable revenue); the risk-free rate discount rate applied to the certainty equivalent cash flows would be unchanged; and the WACC used to discount the expected cash flows would increase. They suggest that if all of the same assumptions were retained, the difference of $58m would *decrease*, when a higher WACC is applied.[431]

648. Although that is one interpretation of the analysis, we do not consider that conclusion is as clear cut as these submissions suggest. The difference between the values of the two types of cash flow could exist for a number of reasons. For example, if the a lower WACC changed the relationship between the expected cash flow and pessimistic case, or there was a changed to the expected cash flow distribution, the then increasing the WACC could potentially result in a lower difference between the two values. However we agree the interactions will be complex and dependent on the assumptions made in the calculation.

Proposed approach

649. We consider that Black's Simple Discount Rule is an intuitively appealing method from which to assess the appropriate rate of return for a regulated business. However there are a number of challenges that need to be overcome before we consider that it could provide material benefit in our regulatory regime. These challenges include:

    649.1 Greater clarity on how the results should be interpreted as a cross-check of the WACC. As noted by CEG and Houston Kemp, when the relationship between the expected and certainty equivalent cash flows is kept consistent,

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429 CEG "Use of Black's simple discount rule in regulatory proceedings" (report prepared for ENA, February 2016), para 72.

430 The value of this difference in the original IWA submission was $254m. However, Houston Kemp and CEG correctly pointed out that this was a comparison of undiscounted cashflows. For comparison purposes the discounted cashflows are required. The expected cashflows need to be discounted at the WACC and the certainty equivalent cashflows need to be discounted at the risk-free rate. Houston Kemp's cross submission on the problem definition paper "Comment on select submissions to the Commission's input methodologies review" (report prepared for Powerco, 4 September 2015), p.4-5; CEG "Use of Black's simple discount rule in regulatory proceedings" (report prepared for ENA, February 2016), para 76-78.

431 Houston Kemp's cross submission on the problem definition paper "Comment on select submissions to the Commission's input methodologies review" (report prepared for Powerco, 4 September 2015), p.5; CEG "Use of Black's simple discount rule in regulatory proceedings" (report prepared for ENA, February 2016), para 72 and 78.

decreases in the WACC appear to increase the difference between the values of the two types of cash flow.

649.2 Determining a robust process for estimating the input parameters, and particularly the probability distribution of future cash flows. We have limited information to determine this information, and because the WACC is an input to these cash flows, the distribution itself could be a function of the WACC chosen. Given the lack of clarity over input parameters, determining them is likely to require consultation with interested parties.

650. We understand that the main benefits of the BSDR in an unregulated context would be to use manager's information to determine the probability distribution of future cash flows.[432] This information could then potentially provide a more accurate estimate of the appropriate risk-adjusted return than the CAPM approach that requires an estimate of the asset beta and TAMRP.

651. In a regulated scenario, this managerial knowledge aspect seems less important, because there might be other means to estimate the certainty equivalent cash flows. For example, we could estimate the historical correlation between revenues of a regulated business and demand fluctuations to determine such an estimate.

652. Particular difficulties for its use in a regulatory context include limited experience/precedent and the difficulties described in estimating probability distribution of expected cash flows. We have limited empirical information to help inform us on this or likely distribution of cash flows. These difficulties (in estimating the probability distribution of future cash flows) are likely to be a key reason why the BSDR has not found common usage elsewhere in both unregulated and regulated situations

653. This differs from our estimates of asset beta and TAMRP when using the CAPM approach, in which we have utilised market information where possible. We prefer to focus on empirical information because we consider it incorporates market impacts not captured under theoretical models and reduces the chance that any individual input could be contentious.

654. The overall implication from the IWA proposal appears to be a suggestion that for a regulated supplier under a revenue cap, there is limited risk to regulated revenues. This would mean the certainty equivalent net cash flows should be close to the expected net cash flows.

655. However, even if we had more information that provided further evidence that this proposition was true, it would be difficult to change our approach given that

[432] There are difficulties in actually using any management information under a regulated scenario, given the managers incentive to maximise their regulatory allowance, see: Dr Lally's expert advice on the cost of debt, asset beta adjustments for GPBs, RAB indexation and inflation risk, and TAMRP "Review of further WACC issues" (report to the Commerce Commission, 22 May 2016).

empirical estimates of asset beta from comparable regulated firms consistently show a positive value for asset beta.

656. Therefore, we agree with Dr Lally's conclusion. We do not propose to use BSDR as a cross-check on the WACC until some of the identified issues have been resolved.

657. Although we have sympathy with the intentions of BSDR to provide another angle from which to assess the WACC, we cannot see a clear way forward to resolve the identified issues and enable sufficient confidence in the outputs. Therefore at this stage we do not consider it appropriate to use BSDR to influence the level of the WACC provided for in the IMs

658. As result we consider it is more appropriate to focus on obtaining suitable inputs (eg, asset beta to be used in the SBL-CAPM) in order to determine the most appropriate compensation estimate for equity risk in a regulated business.

Chapter 8: Application of WACC

Purpose of this chapter

659. The purpose of this chapter is to address issues that have been identified with the application of our WACC estimates. This issues are:

659.1 the timing of the determination and publication of our WACC estimates for airports given the differences between *ex-ante* profitability assessment following an airports price-setting event and *ex-post* profitability assessment;

659.2 the timing of our proposed amendments to WACC made as part of the IM review; and

659.3 the requirement to publish a specific WACC for CPPs.

Airport WACC timing

660. We propose publish quarterly WACC estimates for airports, when requested, for the use of an *ex-ante* profitability assessment under ID regulation.[433]

661. We apply IMs when making our ID determinations for airports. The information required to be disclosed under ID includes a wide range of historic and forecast information and performance measures, covering both financial and non-financial matters.

662. Airports are not required to apply the cost of capital IM when setting their prices, but they must disclose information about the approach they used to set prices. The cost of capital IM enables us to determine a WACC benchmark against which the airports' profitability can be assessed.

663. We currently estimate and publish annual WACC estimates for airports' ID purposes, in April for WIAL and July for AIAL and CIAL. We publish these WACC estimates within one month of the start of the disclosure period.

664. In 2013 and 2014 we conducted s 56G reports to identify how effectively ID regulation is promoting the purpose of Part 4 for airports. Through this process we identified that it was not clear which WACC estimate we would use when assessing airports' profitability at a price setting event.

665. Airports are free to set their prices at any time within the five-year pricing period, which means that the ID WACC, published in either April or July, is not always up-to-date enough to use as a benchmark. We continue to consider that airports can calculate our WACC using the IMs methodology, within a reasonable degree of accuracy. However, as it is currently unclear which WACC estimate we will use when assessing airports' profitability, we consider that we can be more transparent.

[433] We will consider the implementation of this decision in annual historic disclosures in a future process.

666. Therefore, we propose to estimate a WACC for the two quarters that we do not currently calculate one for ID purposes. We will then use the closest quarter WACC estimate (prior to an airports price setting event) in assessing profitability. When airports plan to reset their prices they should request that we publish that quarter's WACC estimate, otherwise we will only publish the two annual ID WACCs in April and July, as we currently do. Even if we do not publish the WACC estimate for we will be able to calculate it and use it as a benchmark through our summary and analysis.

667. This solution provides airports with the certainty as to which WACC estimate they should rely on when making their pricing decisions. We will only publish the extra WACC estimates for quarter 1 and quarter 4 if they are requested, so that we are not unnecessarily increasing regulatory costs.

When will our proposed changes to how we estimate WACC be incorporated in ID regulation?

668. In general, the updated IM determinations for all sectors will take effect (subject to any implementation date exceptions noted in each of the IM determination amendments):

668.1 for ID, at the beginning of the next disclosure year following publication of our final IM determination amendments, or from the next regulatory period following publication of our final IM determination amendments, as appropriate;

668.2 for DPPs, for the next DPP reset after the date of publication of our final IM determination amendments for each sector, which varies for GDBs, GTBs and EDBs;

668.3 for CPPs, for CPP applications made following the date our final GDB, GTB and EDB IM determination amendments are published; and

668.4 for the Transpower IPP, for the next IPP reset after the date of publication of our final IM determination amendments.

669. We are interested in your views on the timing for amendments coming into effect, and whether transitional arrangements may be required for some provisions. In particular, we seek your views on whether certain changes to the IMs for ID should only take effect from the next regulatory period (ie, to maintain alignment between the IMs for ID and price-quality regulation for those suppliers subject to both types of regulation).

CPP/DPP dual WACC

670. We propose to no longer estimate a CPP WACC and to instead apply the DPP WACC to a CPP. This is discussed further in Chapter 6. We will, therefore, no longer publish any specific WACCs for CPPs, and propose to remove the clauses describing the determination of a CPP WACC from the cost of capital IM for EDBs, GDBs, and GTBs.

Attachment A: Further details regarding energy asset beta comparator sample

671. This attachment includes further details regarding the sample of comparator firms used when estimating our proposed (unadjusted) asset beta for EDBs, Transpower and GPBs of 0.34. Specifically:

671.1 Table 28 lists the 74 firms included in our energy comparator sample, including descriptions for each company reported by Bloomberg. Our assessment (based on the company descriptions) of whether each company is predominantly an electricity utility, predominantly a gas utility, or an integrated electricity and gas utility, is also included.

671.2 Table 29 summarises the results for our energy asset beta comparator sample across the four separate 5-year periods we have considered, based on daily, weekly and 4-weekly frequencies.

Table 28: Descriptions of companies in energy asset beta comparator sample

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
AEE US Equity	Ameren Corp	Ameren Corporation is a public utility holding company. The Company, through its subsidiaries, generates electricity, delivers electricity and distributes natural gas to customers in Missouri and Illinois.	Integrated
AEP US Equity	American Electric Power Co Inc	American Electric Power Company, Inc.(AEP) operates as a public utility holding company. The Company provides electric service, consisting of generation, transmission and distribution, on an integrated basis to their retail customers. AEP serves customers in the United States.	Electricity
AES US Equity	AES Corp/VA	The AES Corporation acquires, develops, owns, and operates generation plants and distribution businesses in several countries. The Company sells electricity under long term contracts and serves customers under its regulated utility businesses. AES also mines coal, turns seawater into drinking water, and develops alternative sources of energy.	Electricity
ALE US Equity	ALLETE Inc	ALLETE, Inc. provides energy services in the upper Midwest United States. The Company generates, transmits, distributes, markets, and trades electrical power for retail and wholesale customers.	Electricity
APA AU Equity	APA Group	APA Group is a natural gas infrastructure company. The Company owns and or operates gas transmission and distribution assets whose pipelines span every state and territory in mainland Australia. APA Group also holds minority interests in energy infrastructure enterprises.	Integrated
AST AU Equity	AusNet Services	AusNet Services is an energy delivery service provider. The Company engages in electricity distribution and transmission, and owns gas distribution assets in Victoria, Australia.	Integrated

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
ATO US Equity	Atmos Energy Corp	Atmos Energy Corporation distributes natural gas to utility customers in several states. The Company's non-utility operations span various states and provide natural gas marketing and procurement services to large customers. Atmos Energy also manages company-owned natural gas storage and pipeline assets, including an intrastate natural gas pipeline in Texas.	Gas
AVA US Equity	Avista Corp	Avista Corporation is an energy company that delivers products and solutions to business and residential customers throughout North America. The Company, through Avista Utilities, generates, transmits, and distributes electric and natural gas. Avista's other businesses include Avista Advantage and Avista Energy.	Integrated
BKH US Equity	Black Hills Corp	Black Hills Corporation is a diversified energy company. The Company generates wholesale electricity, produce natural gas, oil and coal, and market energy. Black Hills serves customers in Colorado, Iowa, Kansas, Montana, Nebraska, South Dakota and Wyoming.	Integrated
BWP US Equity	Boardwalk Pipeline Partners LP	Boardwalk Pipeline Partners, LP transports, gathers, and stores natural gas. The Company owns and operates interstate pipeline systems that either serve customers directly or indirectly throughout the northeastern and southeastern United States.	Gas
CMS US Equity	CMS Energy Corp	CMS Energy Corporation is an energy company operating primarily in Michigan. The Company, through its subsidiaries provides electricity and/or natural gas to its customers in Michigan. CMS Energy also invests in and operates non-utility power generation plants in the United States and abroad.	Integrated
CNL US Equity	Cleco Corporate Holdings LLC	Cleco Corporate Holdings LLC generates, transmits, distributes, and sells electricity. The Company, through a subsidiary, offers energy saving tips, efficiency programs, account management, bills payment, and customer assistance services. Cleco conducts its business in the United States.	Integrated
CNP US Equity	CenterPoint Energy Inc	CenterPoint Energy, Inc. is a public utility holding company. The Company, through its subsidiaries, conducts activities in electricity transmission and distribution, natural gas distribution and sales, interstate pipeline and gathering operations, and power generation.	Integrated
CPK US Equity	Chesapeake Utilities Corp	Chesapeake Utilities Corporation is a utility company that provides natural gas transmission and distribution, propane distribution, and information technology services. The Company distributes natural gas to residential, commercial, and industrial customers in Delaware, Maryland, and Florida. Chesapeake Utilities' propane is distributed to customers in Delaware, Maryland, and Virginia.	Gas
D US Equity	Dominion Resources Inc/VA	Dominion Resources, Inc., a diversified utility holding company, generates, transmits, distributes, and sells electric energy in Virginia and northeastern North Carolina. The Company produces, transports, distributes, and markets natural gas to customers in the Northeast and Mid-Atlantic regions of the United States.	Integrated
DGAS US Equity	Delta Natural Gas Co Inc	Delta Natural Gas Company, Inc. distributes, stores, transports, gathers, and produces natural gas. The Company, through its subsidiaries, buys and sells gas, as well as operates underground storage and production properties.	Gas

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
DTE US Equity	DTE Energy Co	DTE Energy Company, a diversified energy company, develops and manages energy-related businesses and services nationwide. The Company, through its subsidiaries, generates, purchases, transmits, distributes, and sells electric energy in southeastern Michigan. DTE is also involved in gas pipelines and storage, unconventional gas exploration, development, and production.	Integrated
DUE AU Equity	DUET Group	DUET Group invests in energy utility assets located in Australia and New Zealand. The Group's investment assets include gas pipelines and electricity distribution networks.	Integrated
DUK US Equity	Duke Energy Corp	Duke Energy Corporation is an energy company located primarily in the Americas that owns an integrated network of energy assets. The Company manages a portfolio of natural gas and electric supply, delivery, and trading businesses in the United States and Latin America.	Integrated
ED US Equity	Consolidated Edison Inc	Consolidated Edison, Inc., through its subsidiaries, provides a variety of energy related products and services. The Company supplies electric service in New York, parts of New Jersey, and Pennsylvania as well as supplies electricity to wholesale customers.	Integrated
EDE US Equity	Empire District Electric Co/Th	The Empire District Electric Company generates, purchases, transmits, distributes, and sells electricity. The Company supplies electricity to parts of Missouri, Kansas, Oklahoma, and Arkansas. Empire also provides water service to several towns in Missouri.	Integrated
EE US Equity	El Paso Electric Co	El Paso Electric Company generates, distributes, and transmits electricity in west Texas and southern New Mexico. The Company also serves wholesale customers in Texas, New Mexico, California, and Mexico. El Paso Electric owns or has partial ownership interests in electrical generating facilities.	Electricity
EEP US Equity	Enbridge Energy Partners LP	Enbridge Energy Partners, L.P. transports and stores hydrocarbon energy. The Company offers crude oil and natural gas liquids to refineries in the Midwestern United States and Eastern Canada.	Gas
EIX US Equity	Edison International	Edison International, through its subsidiaries, develops, acquires, owns, and operates electric power generation facilities worldwide. The Company also provides capital and financial services for energy and infrastructure projects, as well as manages and sells real estate projects. Additionally, Edison provides integrated energy services, utility outsourcing, and consumer products.	Electricity
ES US Equity	Eversource Energy	Eversource Energy is a public utility holding company. The Company, through its subsidiaries, provides retail electric service to customers in Connecticut, New Hampshire, and western Massachusetts. Eversource Energy also distributes natural gas throughout Connecticut.	Integrated
ETR US Equity	Entergy Corp	Entergy Corporation is an integrated energy company that is primarily focused on electric power production and retail electric distribution operations. The Company delivers electricity to utility customers in Arkansas, Louisiana, Mississippi, and Texas. Entergy also owns and operates nuclear plants in the northern United States.	Electricity
EXC US Equity	Exelon Corp	Exelon Corporation is a utility services holding company. The Company, through its subsidiaries distributes electricity to customers in Illinois and Pennsylvania. Exelon also distributes gas to customers in the Philadelphia area as well as operates nuclear power plants in states that include Pennsylvania and New Jersey.	Integrated

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
FE US Equity	FirstEnergy Corp	FirstEnergy Corp. is a public utility holding company. The Company's subsidiaries and affiliates are involved in the generation, transmission and distribution of electricity, exploration and production of oil and natural gas, transmission and marketing of natural gas, and energy management and other energy-related services.	Integrated
GAS US Equity	AGL Resources Inc	AGL Resources Inc. primarily sells and distributes natural gas to customers in Georgia and southeastern Tennessee. The Company also holds interests in other energy-related businesses, including natural gas and electricity marketing, wholesale and retail propane sales, gas supply services, and consumer products.	Gas
GXP US Equity	Great Plains Energy Inc	Great Plains Energy Incorporated provides electricity in the Midwest United States. The Company develops competitive generation for the wholesale market. Great Plains is also an electric delivery company with regulated generation. In addition, the Company is an investment company focusing on energy-related ventures nationwide that are unregulated with high growth potential.	Electricity
HE US Equity	Hawaiian Electric Industries I	Hawaiian Electric Industries, Inc. is a diversified holding company that delivers a variety of services to the people of Hawaii. The Company's subsidiaries offer electric utilities, savings banks and other businesses, primarily in the state of Hawaii.	Electricity
IDA US Equity	IDACORP Inc	IDACORP, Inc is the holding company for Idaho Power Company, an electric utility and IDACORP Energy, an energy marketing company. Idaho Power generates, purchases, transmits, distributes, and sells electric energy in southern Idaho, eastern Oregon, and northern Nevada. IDACORP Energy maintains electricity and natural gas marketing operations.	Electricity
ITC US Equity	ITC Holdings Corp	ITC Holdings Corporation is a holding company. Through subsidiaries, the Company transmits electricity from electricity generating stations to local electricity distribution facilities. ITC invests in electricity transmission infrastructure improvements as a means to improve electricity reliability and reduce congestion.	Electricity
JEL LN Equity	Jersey Electricity PLC	Jersey Electricity PLC generates, imports and distributes electricity. The Company is also involved in electrical appliance retailing, property management and building services contracting. Its other business interests include telecommunications and Internet data hosting.	Electricity
KMI US Equity	Kinder Morgan Inc/DE	Kinder Morgan Inc. is a pipeline transportation and energy storage company. The Company owns and operates pipelines that transport natural gas, gasoline, crude oil, carbon dioxide and other products, and terminals that store petroleum products and chemicals and handle bulk materials like coal and petroleum coke.	Gas
SR US Equity	Spire Inc	Spire Inc. is a public utility company involved in the retail distribution of natural gas. The Company serves an area in eastern Missouri and parts of several other counties. Spire also operates underground natural gas storage fields and transports and stores liquid propane.	Gas

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
LNT US Equity	Alliant Energy Corp	Alliant Energy Corporation provides public-utility service to customers in the Midwest. The Company's utility subsidiaries serve electric, natural gas, and water customers in Illinois, Iowa, Minnesota, and Wisconsin.	Integrated
MGEE US Equity	MGE Energy Inc	MGE Energy, Inc. is a public utility holding company. The Company's principal subsidiary generates and distributes electricity to customers in Dane County, Wisconsin. MGE also purchases, transports, and distributes natural gas in several Wisconsin counties.	Integrated
NEE US Equity	NextEra Energy Inc	NextEra Energy, Inc. provides sustainable energy generation and distribution services. The Company generates electricity through wind, solar, and natural gas. Through its subsidiaries, NextEra Energy also operates multiple commercial nuclear power units.	Electricity
NFG US Equity	National Fuel Gas Co	National Fuel Gas Company is an integrated natural gas company with operations in all segments of the natural gas industry, including utility, pipeline and storage, exploration and production, and marketing operations. The Company operates across the United States.	Gas
NG/ LN Equity	National Grid PLC	National Grid PLC is an investor-owned utility company which distributes gas. The PLC owns and operates the electricity transmission network in England and Wales, the gas transmission network in Great Britain, and electricity transmission networks in the Northeastern United States. National Grid also operates the electricity transmission networks in Scotland.	Integrated
NI US Equity	NiSource Inc	NiSource Inc. is an energy holding company. The Company's subsidiaries provide natural gas, electricity and other products and services to customers located within a corridor that runs from the Gulf Coast through the Midwest to New England.	Integrated
NJR US Equity	New Jersey Resources Corp	New Jersey Resources Corporation provides retail and wholesale energy services to customers in New Jersey and in states from the Gulf Coast to New England, and Canada. The Company's principal subsidiary, New Jersey Natural Gas Co., is a local distribution company serving customers in central and northern New Jersey.	Gas
NWE US Equity	NorthWestern Corp	NorthWestern Corporation, doing business as NorthWestern Energy, provides electricity and natural gas in the Upper Midwest and Northwest serving customers in Montana, South Dakota, and Nebraska.	Integrated
NWN US Equity	Northwest Natural Gas Co	Northwest Natural Gas Company distributes natural gas to customers in western Oregon, as well as portions of Washington. The Company services residential, commercial, and industrial customers. Northwest Natural supplies many of its non-core customers through gas transportation service, delivering gas purchased by these customers directly from suppliers.	Gas
OGE US Equity	OGE Energy Corp	OGE Energy Corp., through its principal subsidiary Oklahoma Gas and Electric Company, generates, transmits, and distributes electricity to wholesale and retail customers in communities in Oklahoma and western Arkansas. The Company, through Enogex Inc., operates natural gas transmission and gathering pipelines, has interests in gas processing plants, and markets electricity.	Integrated

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
OKE US Equity	ONEOK Inc	ONEOK, Inc. is a diversified energy company. The Company is involved in the natural gas and natural gas liquids business across the United States.	Gas
PCG US Equity	PG&E Corp	PG&E Corporation is a holding company that holds interests in energy based businesses. The Company's holdings include a public utility operating in northern and central California that provides electricity and natural gas distribution; electricity generation, procurement, and transmission; and natural gas procurement, transportation, and storage.	Integrated
PEG US Equity	Public Service Enterprise Grou	Public Service Enterprise Group Incorporated is a public utility holding company. The Company, through its subsidiaries, generates, transmits, and distributes electricity and produces natural gas in the Northeastern and Mid Atlantic United States.	Integrated
PNM US Equity	PNM Resources Inc	PNM Resources Inc. is a holding company. The Company, through its subsidiaries, generates, transmits, and distributes electricity.	Electricity
PNW US Equity	Pinnacle West Capital Corp	Pinnacle West Capital Corporation is a utility holding company. The Company, through its subsidiary, provides either retail or wholesale electric service to most of the State of Arizona. The Company, through a subsidiary, also is involved in real estate development activities in the western United States.	Electricity
PNY US Equity	Piedmont Natural Gas Co Inc	Piedmont Natural Gas Company, Inc. is an energy and services company that primarily transports, distributes, and sells natural gas. The Company serves residential, commercial, and industrial customers in North Carolina, South Carolina, and Tennessee. Piedmont also, through subsidiaries, markets natural gas to customers in Georgia.	Gas
POM US Equity	Pepco Holdings LLC	Pepco Holdings, LLC is a diversified energy company. The Company primarily distributes, transmits, and supplies electricity and supplies natural gas to customers in New Jersey, Delaware, Maryland, and the District of Columbia.	Integrated
PPL US Equity	PPL Corp	PPL Corporation is an energy and utility holding company. The Company, through its subsidiaries, generates electricity from power plants in the northeastern and western United States, and markets wholesale and retail energy primarily in the northeastern and western portions of the United States, and delivers electricity in Pennsylvania and the United Kingdom.	Integrated
SCG US Equity	SCANA Corp	SCANA Corporation is a holding company involved in regulated electric and natural gas utility operations, telecommunications, and other energy-related businesses. The Company serves electric customers in South Carolina and natural gas customers in South Carolina, North Carolina, and Georgia. SCANA also has investments in several southeastern telecommunications companies.	Integrated
SE US Equity	Spectra Energy Corp	Spectra Energy Corporation transmits, stores, distributes, gathers, and processes natural gas. The Company provides transportation and storage of natural gas to customers in various regions of the northeastern and southeastern United States, the Maritime Provinces in Canada and the Pacific Northwest in the United States and Canada, and the province of Ontario, Canada.	Gas

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
SJI US Equity	South Jersey Industries Inc	South Jersey Industries, Inc. is an energy services holding company. The Company provides regulated, natural gas service to residential, commercial, and industrial customers in southern New Jersey. South Jersey also markets total energy management services, including natural gas, electricity, demand-side management, and consulting services throughout the eastern United States.	Integrated
SKI AU Equity	Spark Infrastructure Group	Spark Infrastructure Group invests in utility infrastructure assets in Australia.	Integrated
SO US Equity	Southern Co/The	The Southern Company is a public utility holding company. The Company, through its subsidiaries, generates, wholesales, and retails electricity in the southeastern United States. The Company also offers wireless telecommunications services, and provides businesses with two-way radio, telephone, paging, and Internet access services as well as wholesales fiber optic solutions.	Electricity
SRE US Equity	Sempra Energy	Sempra Energy is an energy services holding company with operations throughout the United States, Mexico, and other countries in South America. The Company, through its subsidiaries, generates electricity, delivers natural gas, operates natural gas pipelines and storage facilities, and operates a wind power generation project.	Integrated
SSE LN Equity	SSE PLC	SSE PLC generates, transmits, distributes and supplies electricity to industrial, commercial and domestic customers in the United Kingdom and Ireland. The Company also stores and distributes natural gas, and operates a telecommunications network that offers bandwidth and capacity to companies, public sector organizations, Internet service providers, and others.	Integrated
STR US Equity	Questar Corp	Questar Corporation is a natural gas-focused energy company. The Company's operations include gas and oil exploration and production, midstream field services, energy marketing, interstate gas transportation, and retail gas distribution.	Gas
SWX US Equity	Southwest Gas Corp	Southwest Gas Corporation purchases, transports, and distributes natural gas to residential, commercial, and industrial customers in portions of Arizona, Nevada, and California. The Company also provides construction services to utility companies, including trenching and installation, replacement, and maintenance services for energy distribution systems.	Gas
TCP US Equity	TC PipeLines LP	TC Pipelines, LP acquires, owns, and participates in the management of United States-based pipeline assets. The Company owns interest in the Northern Border Pipeline Company, the owner of an interstate pipeline system that transports natural gas from the Montana-Saskatchewan border to natural gas markets in the Midwestern United States.	Gas
TE US Equity	TECO Energy Inc	TECO Energy, Inc. is a diversified, energy-related utility holding company. The Company, through various subsidiaries, provides retail electric service to customers in west central Florida, as well as purchases, distributes, and markets natural gas for residential, commercial, industrial, and electric power generation customers. Teco also has coal operations.	Integrated

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
UGI US Equity	UGI Corp	UGI Corporation distributes and markets energy products and services. The Company is a domestic and international distributor of propane. UGI also distributes and markets natural gas and electricity, and sells related products and services in the Middle Atlantic region of the United States.	Integrated
UTL US Equity	Unitil Corp	Unitil Corporation, a public utility holding company, conducts a combination electric and gas utility distribution operation in north central Massachusetts and electric utility distribution operations in the seacoast and capital city areas of New Hampshire. The Company is also involved in energy planning, procurement, marketing, and consulting activities.	Integrated
VCT NZ Equity	Vector Ltd	Vector Limited is an energy infrastructure company in New Zealand that provides electricity and gas transmission and distribution along with metering. The Company is also a wholesaler of LPG and natural gas. Vector also delivers broadband voice and data communications in the Auckland and Wellington regions.	Integrated
VVC US Equity	Vectren Corp	Vectren Corporation distributes gas in Indiana and western Ohio and electricity in southern Indiana. The Company's subsidiaries provide energy-related products and services, including energy marketing, fiber-optic telecommunications services, and utility related services. Vectren's services include materials management, debt collection, locating, trenching and meter reading services.	Integrated
WEC US Equity	WEC Energy Group Inc	WEC Energy Group, Inc. operates as a utilities provider. The Company distributes electricity and natural gas to its customers in Wisconsin, Illinois, Michigan and Minnesota.	Integrated
WGL US Equity	WGL Holdings Inc	WGL Holdings Inc., through its Washington Gas Light Company subsidiary, sells and delivers natural gas and other energy-related products and services. The Company serves residential, commercial, and industrial customers throughout metropolitan Washington, D.C. and the surrounding region.	Integrated
WPZ US Equity	Williams Partners LP	Williams Partners LP owns, operates, develops, and acquires natural gas gathering systems and other midstream energy assets. The Company is principally focused on natural gas gathering, the first segment of midstream energy infrastructure that connects natural gas produced at the wellhead to third-party takeaway pipelines.	Gas
WR US Equity	Westar Energy Inc	Westar Energy, Inc. is an electric utility company servicing customers in Kansas. The company provides electric generation, transmission and distribution services.	Electricity
XEL US Equity	Xcel Energy Inc	Xcel Energy, Inc. provides electric and natural gas services. The Company offers a variety of energy-related services, including generation, transmission, and distribution of electricity and natural gas throughout the United States. Xcel utilities serve customers in portions of Colorado, Michigan, Minnesota, New Mexico, North Dakota, South Dakota, Texas and Wisconsin.	Integrated

Table 29: Results for energy asset beta comparator sample

Ticker	Name	1996 - 2001			2001 - 2006			2006 - 2011			2011 - 2016		
		Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly
AEE US Equity	Ameren Corp	0.11	0.07	0.03	0.28	0.27	0.25	0.41	0.39	0.42	0.36	0.30	0.26
AEP US Equity	American Electric Power Co Inc	0.14	0.08	-0.04	0.39	0.39	0.54	0.35	0.32	0.31	0.32	0.27	0.21
AES US Equity	AES Corp/VA	0.42	0.49	0.75	0.41	0.44	0.64	0.52	0.48	0.56	0.37	0.36	0.37
ALE US Equity	ALLETE Inc	0.15	0.08	0.02	0.52	0.52	0.56	0.47	0.44	0.51	0.43	0.37	0.40
APA AU Equity	APA Group	0.15	0.00	0.01	0.21	0.17	0.25	0.27	0.21	0.25	0.39	0.32	0.33
AST AU Equity	AusNet Services	-	-	-	-	-	-	0.16	0.09	0.09	0.24	0.25	0.27
ATO US Equity	Atmos Energy Corp	0.19	0.15	0.14	0.35	0.28	0.25	0.30	0.30	0.32	0.44	0.36	0.31
AVA US Equity	Avista Corp	0.17	0.08	0.16	0.34	0.32	0.36	0.34	0.32	0.36	0.39	0.32	0.30
BKH US Equity	Black Hills Corp	0.24	0.08	-0.09	0.37	0.45	0.59	0.52	0.47	0.59	0.49	0.40	0.46
BWP US Equity	Boardwalk Pipeline Partners LP	-	-	-	0.35	0.01	0.00	0.39	0.45	0.26	0.42	0.40	0.52
CMS US Equity	CMS Energy Corp	0.08	0.04	0.13	0.24	0.28	0.47	0.26	0.24	0.24	0.30	0.24	0.18
CNL US Equity	Cleco Corporate Holdings LLC	0.19	0.12	0.09	0.41	0.45	0.62	0.47	0.39	0.37	0.41	0.36	0.28
CNP US Equity	CenterPoint Energy Inc	0.14	0.08	0.04	0.18	0.25	0.40	0.27	0.28	0.28	0.41	0.36	0.30
CPK US Equity	Chesapeake Utilities Corp	0.03	0.01	0.02	0.09	0.12	0.20	0.54	0.48	0.37	0.54	0.31	0.27
D US Equity	Dominion Resources Inc/VA	0.11	0.07	0.03	0.31	0.28	0.33	0.38	0.35	0.31	0.33	0.27	0.17
DGAS US Equity	Delta Natural Gas Co Inc	0.02	0.03	0.01	0.00	0.04	0.08	0.12	0.20	0.25	0.25	0.25	0.32
DTE US Equity	DTE Energy Co	0.16	0.09	0.03	0.22	0.18	0.21	0.33	0.32	0.33	0.36	0.30	0.23
DUE AU Equity	DUET Group	-	-	-	0.11	0.01	0.01	0.14	0.13	0.16	0.14	0.12	0.13

Ticker	Name	1996 - 2001			2001 - 2006			2006 - 2011			2011 - 2016		
		Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly
DUK US Equity	Duke Energy Corp	0.18	0.10	-0.01	0.44	0.52	0.71	0.37	0.33	0.31	0.26	0.19	0.13
ED US Equity	Consolidated Edison Inc	0.17	0.11	0.09	0.26	0.19	0.17	0.28	0.26	0.23	0.24	0.16	0.06
EDE US Equity	Empire District Electric Co/Th	0.07	0.06	0.04	0.29	0.27	0.32	0.35	0.31	0.36	0.38	0.28	0.22
EE US Equity	El Paso Electric Co	0.14	0.11	0.15	0.36	0.28	0.26	0.44	0.39	0.45	0.37	0.31	0.27
EEP US Equity	Enbridge Energy Partners LP	0.16	0.17	0.08	0.16	0.20	0.06	0.40	0.49	0.51	0.49	0.52	0.62
EIX US Equity	Edison International	0.14	0.10	0.04	0.34	0.29	0.31	0.48	0.45	0.44	0.32	0.27	0.26
ES US Equity	Eversource Energy	0.07	0.07	0.16	0.18	0.18	0.17	0.30	0.29	0.28	0.36	0.30	0.25
ETR US Equity	Entergy Corp	0.09	0.05	0.02	0.27	0.29	0.35	0.44	0.37	0.39	0.28	0.23	0.22
EXC US Equity	Exelon Corp	0.11	0.05	-0.08	0.31	0.27	0.36	0.66	0.59	0.51	0.35	0.27	0.18
FE US Equity	FirstEnergy Corp	0.12	0.02	0.00	0.25	0.20	0.24	0.42	0.37	0.34	0.27	0.21	0.12
GAS US Equity	AGL Resources Inc	0.18	0.17	0.17	0.35	0.34	0.36	0.36	0.37	0.33	0.31	0.24	0.12
GXP US Equity	Great Plains Energy Inc	0.12	0.12	0.17	0.28	0.34	0.40	0.32	0.33	0.44	0.32	0.30	0.30
HE US Equity	Hawaiian Electric Industries I	0.24	0.15	0.07	0.41	0.40	0.43	0.39	0.44	0.45	0.50	0.43	0.37
IDA US Equity	IDACORP Inc	0.18	0.13	0.05	0.30	0.35	0.42	0.35	0.32	0.29	0.45	0.37	0.38
ITC US Equity	ITC Holdings Corp	-	-	-	0.49	0.02	0.02	0.43	0.45	0.49	0.32	0.26	0.19
JEL LN Equity	Jersey Electricity PLC	-	-	-	0.00	0.02	0.04	0.00	-0.01	-0.09	0.01	0.04	0.02
KMI US Equity	Kinder Morgan Inc/DE	-	-	-	-	-	-	0.26	0.00	0.00	0.53	0.55	0.56
SR US Equity	Spire Inc	0.16	0.14	0.08	0.40	0.34	0.29	0.44	0.34	0.14	0.44	0.32	0.30
LNT US Equity	Alliant Energy Corp	0.12	0.08	0.04	0.29	0.30	0.27	0.48	0.46	0.43	0.42	0.35	0.31
MGEE US Equity	MGE Energy Inc	0.23	0.11	0.05	0.62	0.41	0.33	0.48	0.38	0.27	0.59	0.37	0.31
NEE US Equity	NextEra Energy Inc	0.13	0.05	-0.03	0.30	0.28	0.28	0.44	0.40	0.36	0.33	0.29	0.25
NFG US Equity	National Fuel Gas Co	0.20	0.16	0.08	0.30	0.34	0.40	0.75	0.73	0.76	0.80	0.81	0.79
NG/ LN Equity	National Grid PLC	0.51	0.51	0.47	0.28	0.23	0.30	0.32	0.28	0.27	0.31	0.27	0.26

Ticker	Name	1996 - 2001			2001 - 2006			2006 - 2011			2011 - 2016		
		Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly
NI US Equity	NiSource Inc	0.08	0.04	0.01	0.26	0.24	0.31	0.33	0.33	0.36	0.37	0.33	0.22
NJR US Equity	New Jersey Resources Corp	0.16	0.11	0.09	0.40	0.36	0.26	0.48	0.40	0.28	0.59	0.43	0.35
NWE US Equity	NorthWestern Corp	-	-	-	0.19	0.02	0.02	0.36	0.35	0.38	0.40	0.31	0.30
NWN US Equity	Northwest Natural Gas Co	0.20	0.13	0.08	0.34	0.28	0.19	0.42	0.34	0.22	0.39	0.28	0.24
OGE US Equity	OGE Energy Corp	0.14	0.07	0.05	0.28	0.23	0.26	0.50	0.46	0.50	0.54	0.51	0.46
OKE US Equity	ONEOK Inc	0.27	0.21	0.15	0.33	0.36	0.36	0.49	0.47	0.56	0.66	0.66	0.58
PCG US Equity	PG&E Corp	0.11	0.07	0.05	0.51	0.43	0.54	0.36	0.28	0.27	0.30	0.23	0.27
PEG US Equity	Public Service Enterprise Grou	0.12	0.07	0.00	0.27	0.29	0.37	0.54	0.44	0.41	0.44	0.36	0.23
PNM US Equity	PNM Resources Inc	0.12	0.09	0.06	0.37	0.39	0.60	0.38	0.40	0.43	0.38	0.29	0.28
PNW US Equity	Pinnacle West Capital Corp	0.07	0.02	-0.04	0.33	0.36	0.49	0.33	0.32	0.33	0.39	0.33	0.29
PNY US Equity	Piedmont Natural Gas Co Inc	0.20	0.18	0.10	0.41	0.38	0.35	0.49	0.41	0.25	0.50	0.41	0.45
POM US Equity	Pepco Holdings LLC	-	-	-	0.23	0.11	0.14	0.34	0.34	0.34	0.24	0.21	0.19
PPL US Equity	PPL Corp	0.14	0.09	0.01	0.33	0.36	0.51	0.49	0.40	0.34	0.26	0.23	0.19
SCG US Equity	SCANA Corp	0.14	0.05	-0.03	0.26	0.26	0.29	0.34	0.30	0.33	0.32	0.26	0.25
SE US Equity	Spectra Energy Corp	-	-	-	-	-	-	0.61	0.56	0.61	0.56	0.51	0.45
SJI US Equity	South Jersey Industries Inc	0.09	0.06	0.08	0.25	0.23	0.22	0.46	0.38	0.27	0.53	0.41	0.43
SKI AU Equity	Spark Infrastructure Group	-	-	-	-	-	-	0.28	0.21	0.21	0.39	0.30	0.19
SO US Equity	Southern Co/The	0.13	0.01	-0.04	0.26	0.14	0.10	0.30	0.23	0.22	0.23	0.18	0.09

Ticker	Name	1996 - 2001			2001 - 2006			2006 - 2011			2011 - 2016		
		Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly
SRE US Equity	Sempra Energy	0.10	-0.01	-0.12	0.42	0.45	0.57	0.54	0.51	0.52	0.43	0.38	0.38
SSE LN Equity	SSE PLC	0.24	0.13	0.17	0.36	0.29	0.31	0.47	0.41	0.36	0.45	0.43	0.42
STR US Equity	Questar Corp	0.21	0.18	0.13	0.43	0.50	0.63	1.09	1.02	0.90	0.52	0.46	0.32
SWX US Equity	Southwest Gas Corp	0.17	0.15	0.22	0.28	0.25	0.22	0.43	0.39	0.40	0.50	0.37	0.38
TCP US Equity	TC PipeLines LP	0.14	0.05	-0.04	0.17	0.26	0.16	0.33	0.44	0.52	0.45	0.54	0.60
TE US Equity	TECO Energy Inc	0.12	0.04	-0.05	0.29	0.33	0.39	0.42	0.39	0.42	0.39	0.35	0.21
UGI US Equity	UGI Corp	0.17	0.14	0.07	0.29	0.31	0.24	0.37	0.34	0.29	0.47	0.45	0.44
UTL US Equity	Unitil Corp	0.06	0.08	0.20	0.03	0.04	0.03	0.09	0.12	0.15	0.34	0.20	0.15
VCT NZ Equity	Vector Ltd	-	-	-	0.43	0.06	0.04	0.24	0.20	0.28	0.25	0.16	0.19
VVC US Equity	Vectren Corp	0.44	0.05	0.01	0.32	0.31	0.31	0.34	0.32	0.29	0.43	0.37	0.39
WEC US Equity	WEC Energy Group Inc	0.13	0.07	0.03	0.20	0.21	0.19	0.29	0.27	0.25	0.35	0.26	0.15
WGL US Equity	WGL Holdings Inc	0.28	0.20	0.13	0.43	0.35	0.30	0.49	0.39	0.26	0.56	0.42	0.39
WPZ US Equity	Williams Partners LP	-	-	-	-	-	-	0.40	0.02	0.00	0.60	0.76	0.82
WR US Equity	Westar Energy Inc	0.07	0.02	-0.04	0.25	0.24	0.25	0.36	0.35	0.33	0.33	0.28	0.26
XEL US Equity	Xcel Energy Inc	0.16	0.08	0.03	0.31	0.26	0.48	0.31	0.26	0.25	0.30	0.23	0.17
Average		*0.16*	*0.10*	*0.07*	*0.30*	*0.27*	*0.31*	*0.39*	*0.36*	*0.34*	*0.39*	*0.34*	*0.30*

Attachment B: Further details regarding airports asset beta comparator sample

672. This attachment includes further details regarding the sample of comparator firms used when estimating our proposed (unadjusted) asset beta for airports of 0.63. Specifically:

672.1 Table 30 lists the 26 firms included in our airports comparator sample, including descriptions for each company reported by Bloomberg; and

672.2 Table 31 summarises the results for our airports asset beta comparator sample across the four separate 5-year periods we have considered, based on daily, weekly and 4-weekly frequencies.

Table 30: Descriptions of companies in airports asset beta comparator sample

Ticker	Name	Bloomberg description
000089 CH Equity	Shenzhen Airport Co	Shenzhen Airport Co., Ltd. provides airport terminal ground passenger transportation and cargo delivery services. The Company also leases airport lounge, designs and publishes advertisements, and offers air ticket agency services.
357 HK Equity	HNA Infrastructure Company Ltd	HNA Infrastructure Company Ltd provides airfield services, terminal facilities, ground handling services, passenger and cargo handling services. The Company also leases commercial and retail space at the Meilan Airport, operates airport-related business franchising, advertising, car parking, tourism services, and sells duty-free and consumable goods.
600004 CH Equity	Guangzhou Baiyun International	Guangzhou Baiyun International Airport Co., Ltd. operates the Guangzhou Baiyun International Airport and provides related transportation services, including ground, passenger, storage, airplane maintenance and repair, and other services. The Company also provides food, space rental, and advertising services.
600009 CH Equity	Shanghai International Airport	Shanghai International Airport Co., Ltd. operates Pudong Airport and Hongquiao airport in Shanghai. The Company provides a full range of services including air traffic control, terminal management, cargo handling, advertising, space rental, and other related services.
600897 CH Equity	Xiamen International Airport C	Xiamen International Airport Co., Ltd. operates and maintains Gaoqi Airport. The Company provides terminal transportation service, maintains airport waiting halls, operates airport shopping malls, as well as offers advertising and airport mechanical engineering services.
694 HK Equity	Beijing Capital International	Beijing Capital International Airport Company Limited operates both aeronautical and non-aeronautical business in the Beijing airport. The Company provides aircraft movement and passenger service facilities, safety and security services, fire-fighting services, and ground handling services. In addition, Beijing Capital operates duty free and other retail shops and leases properties.
8864 JP Equity	Airport Facilities Co Ltd	AIRPORT FACILITIES Co., LTD. manages and leases airport facilities at Haneda Airport in Tokyo and at Itami Airport in Osaka. The Company constructs, operates, and maintains air-conditioning, water supply, and sanitation systems for airport facilities. The Company also manages Narita International Airport facilities through its subsidiary.

9706 JP Equity	Japan Airport Terminal Co Ltd	Japan Airport Terminal Co., Ltd. constructs, manages and maintains passenger terminals and airport facilities at Haneda and Narita airports. The Company operates parking-lots, souvenir shops, and duty-free stores. Japan Airport Terminal, through its subsidiaries, manages restaurants and in-flight meal services.
ADP FP Equity	Aeroports de Paris	Aeroports de Paris (ADP) manages all the civil airports in the Paris area. The Company also develops and operates light aircraft aerodromes. ADP offers air transport related services, and business services such as office rental.
AERO SG Equity	Aerodrom Nikola Tesla AD Beogr	Aerodrom Nikola Tesla AD Beograd operates an international airport near Belgrade, Serbia. The airport serves passengers traveling to European and Middle Eastern destinations. The Company offers ground handling of aircraft, passengers, goods and mail; runway maintenance; advertising space rental; and maintenance of airport utilities and power infrastructure.
AIA NZ Equity	Auckland International Airport	Auckland International Airport Limited owns and operates the Auckland International Airport. The Airport includes a single runway, an international terminal and two domestic terminals. The Airport also has commercial facilities which includes airfreight operations, car rental services, commercial banking center and office buildings.
AOT TB Equity	Airports of Thailand PCL	Airports of Thailand Public Company Ltd. operates the Bangkok International Airport (Don Muang) and the New Bangkok International Airport (Suvarnabhumi).. The Company also operates provincial airports in Chiang Mai, Chiang Rai, Hat Yai, and Phuket.
ASURB MM Equity	Grupo Aeroportuario del Surest	Grupo Aeroportuario del Sureste S.A.B. de C.V. operates airports in Mexico. The Company holds 50 year concessions, beginning in 1998, to manage airports in Cancun, Cozumel, Merida, Oaxaca, Veracruz, Huatulco, Tapachula, Minatitlan, and Villahermosa.
FHZN SW Equity	Flughafen Zuerich AG	Flughafen Zuerich AG operates the Zurich Airport. The Company constructs, leases, and maintains airport structures and equipment.
FLU AV Equity	Flughafen Wien AG	Flughafen Wien AG manages, maintains, and operates the Vienna International Airport and the Voslau Airfield. The Company offers terminal services, air-side and land-side cargo handling, and the leasing of store, restaurant, and hotel airport building space to third party operators and businesses.
FRA GR Equity	Fraport AG Frankfurt Airport S	Fraport AG Frankfurt Airport Services Worldwide offers airport services. The Company operates the Frankfurt-Main, Frankfurt-Hahn and other German airports, the airport in Lima, Peru, and the international terminal in Antalya, Turkey. Fraport also provides services to domestic and international carriers including traffic, facility and terminal management, ground handling, and security.
GAPB MM Equity	Grupo Aeroportuario del Pacifi	Grupo Aeroportuario del Pacifico SAB de CV operates and maintains airports in the Pacific and central regions of Mexico.
GMRI IN Equity	GMR Infrastructure Ltd	GMR Infrastructure is an infrastructure company with interests in airports, power and roads. The Company is developing a greenfield international airport at Hyderabad, and is also operating, managing and developing the Delhi airport. Additionally, it is involved in development and operation of power plants and road projects in India.
KBHL DC Equity	Kobenhavns Lufthavne	Kobenhavns Lufthavne A/S (Copenhagen Airports A/S - CPH) owns and operates Kastrup, the international airport in Copenhagen, and Roskilde airport. The Company provides traffic management, maintenance, and security services, as well as manages the Airport Shopping Center and airport projects. Kobenhavns Lufthavne also has investments in airports in Mexico, England, and China.

MAHB MK Equity	Malaysia Airports Holdings Bhd	Malaysia Airports Holdings Berhad is an investment holding company. The Company, through its subsidiaries, provides management, maintenance, and operation of designated airports. Malaysia Airports also operates duty-free and non-duty free stores as well as provides food and beverage outlets at the airports.
MIA MV Equity	Malta International Airport PL	Malta International Airport PLC operates the Malta International airport.
OMAB MM Equity	Grupo Aeroportuario del Centro	Grupo Aeroportuario del Centro Norte, S.A.B. de C.V. (OMA) operates international airports in the northern and central regions of Mexico. The airports serve Monterrey, Acapulco, Mazatlan, Zihuatanejo and several other regional centers and border cities.
SAVE IM Equity	SAVE SpA/Tessera	SAVE SpA operates the Marco Polo Airport in Venice, Italy. The Company operates through a concession from Italy's Ministry of Transport.
SYD AU Equity	Sydney Airport	Sydney Airport operates the Sydney, Australia airport. The Company develops and maintains the airport infrastructure and leases terminal space to airlines and retailers.
TAVHL TI Equity	TAV Havalimanlari Holding AS	TAV Havalimanlari Holding AS is an airport operator. The Company operates in airports in Turkey, Georgia, Tunisia, Macedonia, Saudi Arabia and Latvia. TAV Havalimanlari provides service in all areas of airport operations such as duty-free, food and beverage, ground handling, IT, security and operations.
TYA IM Equity	Toscana Aeroporti SpA	Toscana Aeroporti S.p.A. is the management company for Florence and Pisa airports. The Company offers flights around the world.

Table 31: Results for airports asset beta comparator sample

Airport sample	Name	1996-2001			2001 -2006			2006-2011			2011-2016		
		Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly
000089 CH Equity	Shenzhen Airport Co	-	-	-	0.76	0.68	0.60	0.90	0.69	0.78	0.87	0.85	0.97
357 HK Equity	HNA Infrastructure Company Ltd	-	-	-	0.79	0.40	0.42	0.59	0.68	1.25	0.76	0.81	0.92
600004 CH Equity	Guangzhou Baiyun International	-	-	-	1.05	0.34	0.26	0.83	0.67	0.65	1.04	0.93	0.96
600009 CH Equity	Shanghai International Airport	-	-	-	0.74	0.69	0.65	0.83	0.71	0.80	0.91	0.86	0.81
600897 CH Equity	Xiamen International Airport C	-	-	-	1.05	0.92	0.87	0.89	0.64	0.65	1.04	1.02	1.06
694 HK Equity	Beijing Capital International	0.59	0.11	0.08	0.91	0.88	0.89	0.98	1.04	1.06	0.44	0.38	0.42
8864 JP Equity	Airport Facilities Co Ltd	-	-	-	0.34	0.37	0.32	0.50	0.44	0.48	0.59	0.54	0.62
9706 JP Equity	Japan Airport Terminal Co Ltd	-	-	-	0.55	0.57	0.67	0.73	0.68	0.65	0.90	0.84	0.93
ADP FP Equity	Aeroports de Paris	-	-	-	-	-	-	0.64	0.67	0.66	0.41	0.42	0.40
AERO SG Equity	Aerodrom Nikola Tesla AD Beogr	-	-	-	-	-	-	-	-	-	1.04	1.21	1.13
AIA NZ Equity	Auckland International Airport	0.58	0.34	0.46	0.83	0.87	0.82	0.79	0.71	0.68	0.82	0.60	0.69
AOT TB Equity	Airports of Thailand PCL	-	-	-	0.64	0.10	0.11	0.57	0.55	0.71	0.99	1.05	1.23
ASURB MM Equity	Grupo Aeroportuario del Surest	0.38	0.03	0.04	0.41	0.30	0.69	0.58	0.51	0.68	0.69	0.74	0.69
FHZN SW Equity	Flughafen Zuerich AG	0.14	0.14	0.37	0.09	0.10	0.28	0.30	0.47	0.66	0.49	0.54	0.61
FLU AV Equity	Flughafen Wien AG	-	-	-	0.67	0.48	0.88	0.41	0.49	0.57	0.23	0.27	0.26
FRA GR Equity	Fraport AG Frankfurt Airport S	-	-	-	0.31	0.51	0.61	0.63	0.70	0.74	0.37	0.40	0.40
GAPB MM Equity	Grupo Aeroportuario del	-	-	-	0.23	0.00	0.00	0.66	0.65	0.75	0.57	0.63	0.61

Airport sample	Name	1996-2001			2001 -2006			2006-2011			2011-2016		
		Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly
	Pacifi												
GMRI IN Equity	GMR Infrastructure Ltd	-	-	-	-	-	-	0.91	0.82	0.97	0.38	0.40	0.50
KBHL DC Equity	Kobenhavns Lufthavne	0.22	0.24	0.36	0.30	0.34	0.52	0.20	0.21	0.42	0.21	0.24	0.38
MAHB MK Equity	Malaysia Airports Holdings Bhd	0.97	0.10	0.12	1.12	1.11	1.11	0.70	0.66	0.79	0.67	0.85	1.07
MIA MV Equity	Malta International Airport PL	-	-	-	-	-	-	0.24	0.30	0.52	0.36	0.45	0.87
OMAB MM Equity	Grupo Aeroportuario del Centro	-	-	-	-	-	-	0.65	0.61	0.86	0.57	0.56	0.73
SAVE IM Equity	SAVE SpA/Tessera	-	-	-	0.87	0.05	0.07	0.38	0.46	0.70	0.18	0.21	0.25
SYD AU Equity	Sydney Airport	-	-	-	0.90	0.44	0.62	0.48	0.45	0.52	0.34	0.26	0.20
TAVHL TI Equity	TAV Havalimanlari Holding AS	-	-	-	-	-	-	0.39	0.30	0.38	0.40	0.38	0.25
TYA IM Equity	Toscana Aeroporti SpA	-	-	-	-	-	-	0.20	0.21	0.38	0.04	0.12	0.31
Average		*0.48*	*0.16*	*0.24*	*0.66*	*0.48*	*0.55*	*0.60*	*0.57*	*0.69*	*0.59*	*0.60*	*0.66*

Attachment C: Nelson-Siegel-Svensson approach to modelling yield curves

Purpose of this attachment

673. In conjunction with the Victoria University Business School, we initiated a summer research project focussing on assessing potential alternative approaches that could be used to estimate the debt premium for services regulated under Part 4. The research focussed on the NSS yield curve approach, which is described in this attachment.

Summary

674. The Nelson-Siegel term structure approach is used extensively internationally by central banks and other market participants for modelling the interest rate term structure. The framework has also been applied by other organisations (such as CEG) to estimate the debt premium.[434]

675. The framework allows for a yield curve[435] with the 'humped' shape often associated with bond-yield term structures. We can include additional dummy variables in the model to account for the average level difference between bond ratings. These variables allow for an extended bond sample without significant skewing of the curve.

676. Using an annual averaging period under the NSS framework may introduce less relevant data at the time of estimation. A single monthly averaging period would consider the most relevant data but could suffer from a lack of bonds and volatile parameter estimates. For the purposes of this paper, a three-month averaging period was used as it appears to be a good trade-off between relevancy and robustness.

677. The NSS approach can objectively and transparently replicate the estimation of the debt premium over time, and appears to achieve reasonable accuracy. Therefore, the NSS framework appears well-suited to modelling the debt premium for WACC determinations.

The Nelson-Siegel-Svensson framework to estimating the yield curve

678. Yield curves are used extensively by central banks, financial institutions and government organisations around the world to price assets, manage and allocate risk and design policies.

679. The yield curve can be used to display the relationship between term to maturity and bid-yields of bonds (or in this case the debt premium). The yield curve works through an estimation methodology to derive a curve based on observed values.

[434] CEG report - Estimating the regulatory debt risk premium for Victorian gas businesses.
[435] When 'yield curve' is used in this paper, we are referring to a debt premium curve.

680. The original framework was proposed by Nelson and Siegel in 1987 and later extended by Svensson in 1994. The Svensson extension improves the flexibility of the curve, but comes at the cost of two extra parameters.

681. The NSS model is defined as (formula 1):

$$DRP(t) = \beta_1 + \beta_2 \left[\frac{1 - e^{(-\frac{t}{\lambda_1})}}{t/\lambda_1}\right] + \beta_3 \left[\frac{1 - e^{(-\frac{t}{\lambda_1})}}{t/\lambda_1} - e^{(-\frac{t}{\lambda_1})}\right] + \beta_4 \left[\frac{1 - e^{(-\frac{t}{\lambda_2})}}{t/\lambda_2} - e^{(-\frac{t}{\lambda_2})}\right]$$

Where:

- $DRP(t)$ is the debt risk premium;
- β_1 is a constant term independent of the term to maturity, interpreted as the long-run yield of the curve;
- β_2 impacts the beginning segment of the curve and is weighted by the term to maturity;
- β_3 is weighted by term to maturity and adds a 'hump' to the curve;
- β_4 is weighted by the term to maturity and allows for a secondary 'hump' to the curve;
- λ_1 is a constant associated with the β_2 and β_3 terms;
- λ_2 is a constant associated with the β_4 term;
- t/λ_1 influences the weight functions for β_2 and β_3, determining where the hump is observed in the curve (where t is the term to maturity); and
- t/λ_2 influences the weight function of β_4, determining the secondary hump.

682. The parameters of the yield curve are estimated through minimising the squared deviations between the estimated yield curve and observed data points (ie, through optimising the beta and lambda parameters). The optimised parameters indicate the shape of the yield curve.

683. In this paper the dataset used for estimation has been sourced from the Commission's existing debt premium and risk-free rate determination spreadsheets.

684. These determinations extract bond data from Bloomberg and annualise for use in debt premium estimation. Bonds with terms to maturity less than 1 year were not

included in the dataset as these bonds can be affected by external factors. For example, PwC notes:[436]

> Bonds that had less than one year to maturity were eliminated. The yields on bonds with less than a year to maturity remaining are influenced by monetary policy, and their inclusion would be likely to distort the shape of the debt risk premium curve. We understand from discussion with market price makers that bonds with less than a year to maturity are ignored when the yield relativities of bonds with longer terms to maturity are being considered.

685. According to the European Central Bank,[437] there are four main reasons for the popularity of the Nelson-Siegel model:

685.1 the model is easy to estimate;

685.2 the yield curve can provide estimates for all maturities (ie, bonds not observable in the market);

685.3 factors have intuitive interpretation so that estimations and conclusions are easily communicated from the model; and

685.4 the model has been proven to fit data well.

686. For an EDB/GPB, the industry bond rating to estimate the debt premium is BBB+ rated bonds. This paper explores the NSS framework assuming the determination of an EDB/GBP debt premium, but can be easily applied to the airport sector (with a desired rating of A-).

Creating a bond sample with BBB, BBB+ and A- bonds

687. To estimate a NSS yield curve using a three-month averaging period requires a data set of suitable bonds. As BBB+ is the rating we would expect a benchmark EDB/GPB bond to have, we would like our bond sample to centre around the BBB+ rating.

688. We have included majority government-owned bonds in the sample to expand the number of observations. In a 2013 report by CEG,[438] it was stated that samples with fewer than 15 bonds can end up with volatile results: "the reliability of results with such small sample sizes is highly questionable".

689. We can also include bonds from within two notches of the BBB+ credit rating ie, include BBB and A- bonds in the sample. This would expand the sample but at the cost of including bonds that potentially do not represent what a BBB+ benchmark would be.

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436 PricewaterCoopers "Electranet: Estimating the benchmark debt risk premium" (May 2012), p.13.

437 European Central Bank (2008). https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp874.pdf?4b32dc2539d2598c420ec5e96a3891f7

438 Competition Economists Group "Estimating the debt risk premium" (June 2013), p.14.

690. We attempt to mitigate the non-representative effects of these additional bonds with the use of dummy variables in the NSS estimation function.

691. Including bonds from within two notches of the BBB+ credit rating (BBB and A-) provides an overall sample of 29 bonds for the month of April 2016 (13 A-, 5 BBB and 11 BBB+ bonds).

692. In the same CEG report, it was discussed whether including bonds with similar credit ratings was a viable approach. By adding these additional bonds, it assumes that the shapes of similarly rated curves are the same. The only difference between the bonds would be the level of the curve (eg, the β_1 term for the A- yield curve would be smaller than that for the BBB+ curve). This was considered a reasonable assumption when the bond ratings are very close to one another.

693. By creating dummy variables to take into account the effect of the BBB and A- rated bonds, additional information can be used to inform our estimation of the BBB+ yield curve.

694. This gives us the new function including an additional two beta parameters (formula 2):

$$DRP(t) = \beta_1 + \beta_2\left[\frac{1-e^{(-\frac{t}{\lambda_1})}}{t/\lambda_1}\right] + \beta_3\left[\frac{1-e^{(-\frac{t}{\lambda_1})}}{t/\lambda_1} - e^{(-\frac{t}{\lambda_1})}\right] + \beta_4\left[\frac{1-e^{(-\frac{t}{\lambda_2})}}{t/\lambda_2} - e^{(-\frac{t}{\lambda_2})}\right] + \beta_5 BBB + \beta_6 A -$$

Where:

- β_5 is a binary dummy variable for BBB rated bonds; and
- β_6 is a binary dummy variable for A- rated bonds.

Applying a BBB+ only sample of bonds

695. Figure 12, Figure 13 and Figure 14 show the yield curves using only BBB+ rated bonds from October 2015 to January 2016 for WACC calculation months. There are fewer observations in these yield curves (10 observations each – i.e. only four degrees of freedom) but the curves appear very well-fitted.

696. Without the bonds from the outer ratings (BBB and A-) the NSS fitted curve and observed values appear to have little deviation. The strictly BBB+ rated curves display a linear trend, likely because there are no short/long-term bonds in the sample.

Figure 12: October 2015 NSS Curve – BBB+

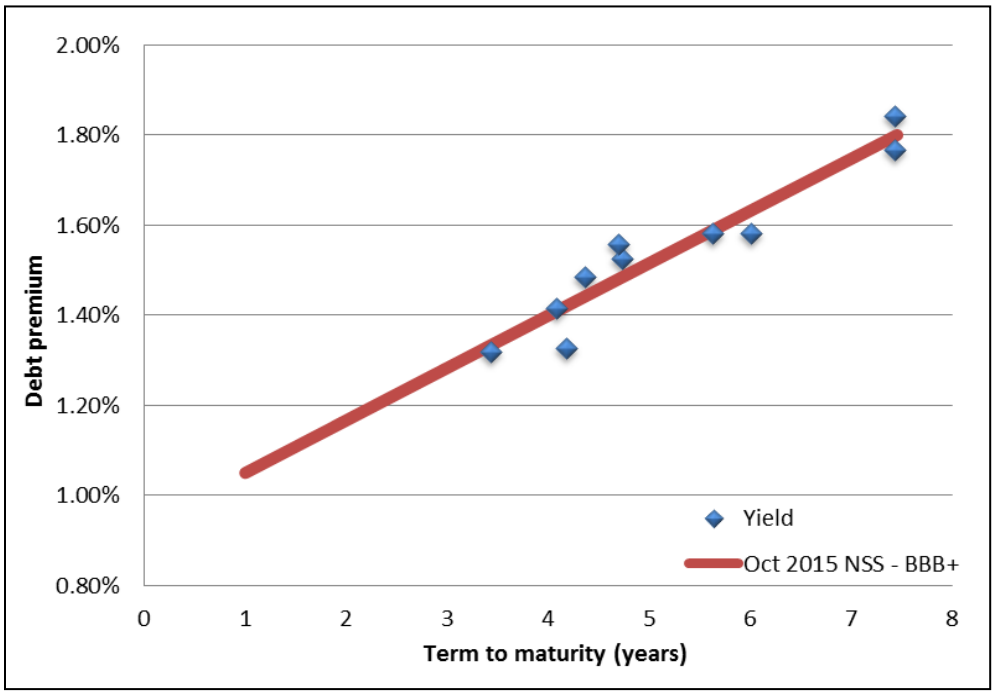


Figure 13: December 2015 NSS Curve – BBB+

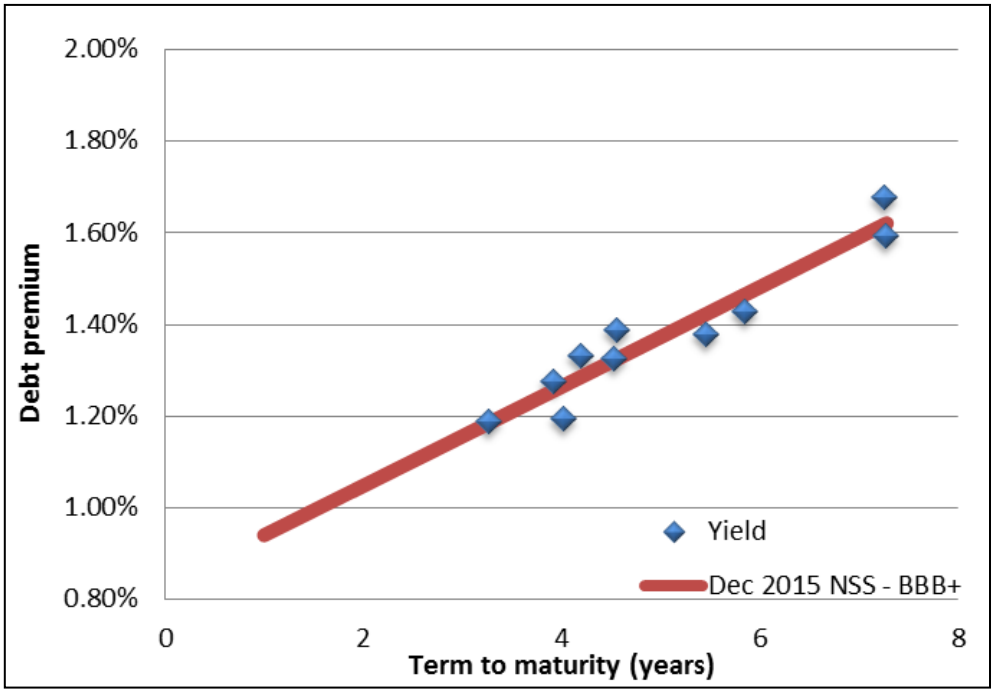
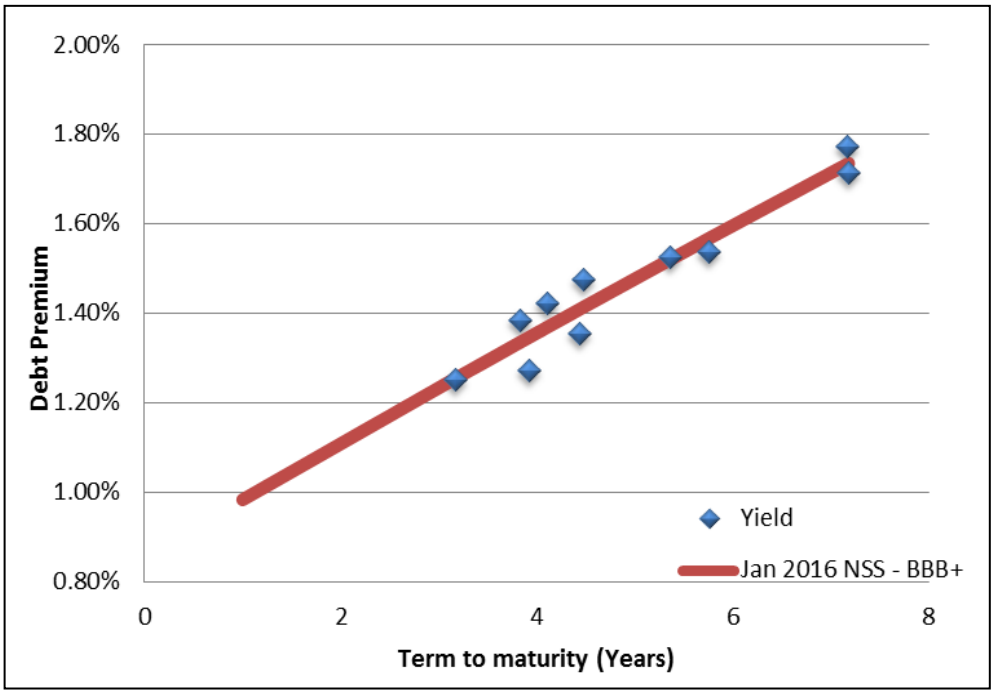


Figure 14: January 2016 BBB+ NSS Curve – BBB+



697. Table 32 summarises statistical information on the fitted yield curves. These statistical tests for the BBB+ only sample can be used as a comparison with larger sample of bonds. The average five-year estimate for the three months from October to January of 1.46% is slightly higher than that of the full sample for the same time period (1.42%).

Table 32: Summary statistics for BBB+ only bonds

Month	5-year estimate	R-Squared	RMSE	Sum of residuals squared
January 2016	1.48%	0.96	2.15E-07	2.04E-06
December 2015	1.37%	0.96	1.64E-07	1.89E-06
October 2015	1.52%	0.95	2.31E-07	2.42E-06
Average	**1.46%**	**0.96**	**2.03E-07**	**2.12E-06**

698. The average R-squared of 0.96 is high, indicating that on average 96% of the variation in the observed debt premium is explained by the model using three months of observations.

Applying a BBB, BBB+ and A- sample of bonds

699. Using dummy variables within the NSS framework (formula 2) provides the flexibility to include A- and BBB+ rated bonds; β_5 can be used to capture the average level shift

difference in the yields of BBB bonds and β_6 the average level shift difference in the yield of A- bonds, from the benchmark BBB+ bonds.

700. In Figure 15, the yield curve is estimated taking no account of differences in credit rating (formula 1). The higher rated A- bond debt premiums noticeably sit below the estimated yield curve. Controlling for the A- rated bonds can be expected to result in higher estimated BBB+ debt premiums.

Figure 15: Unadjusted NSS Curve (Oct 2015 – Jan 2016)

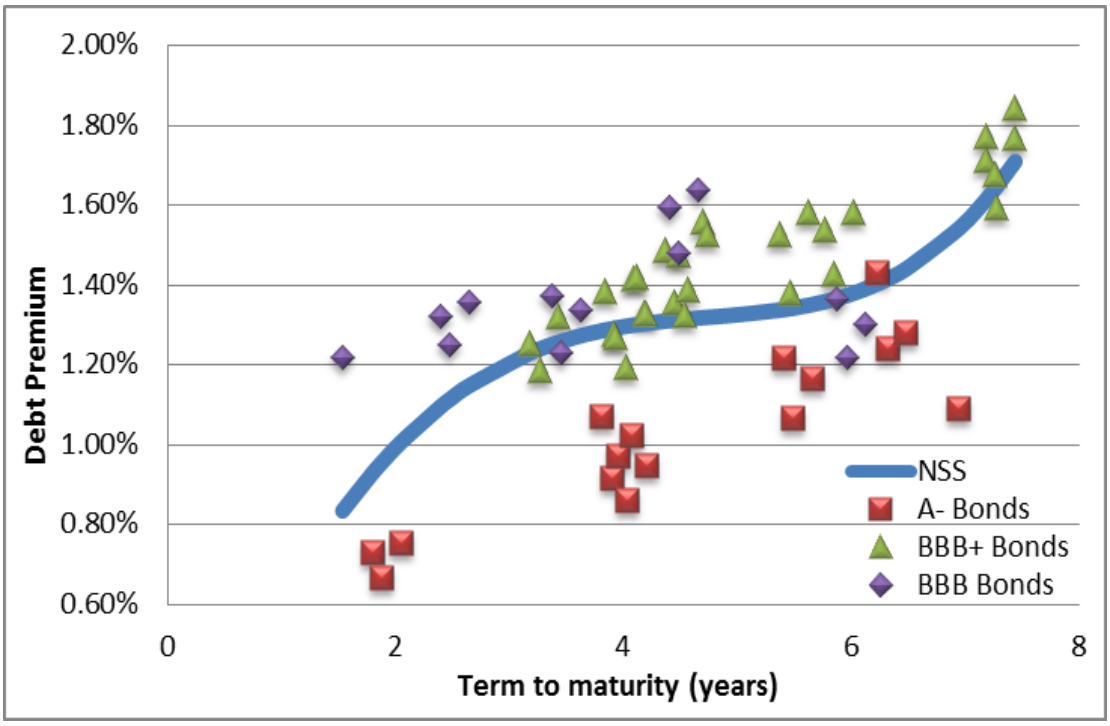
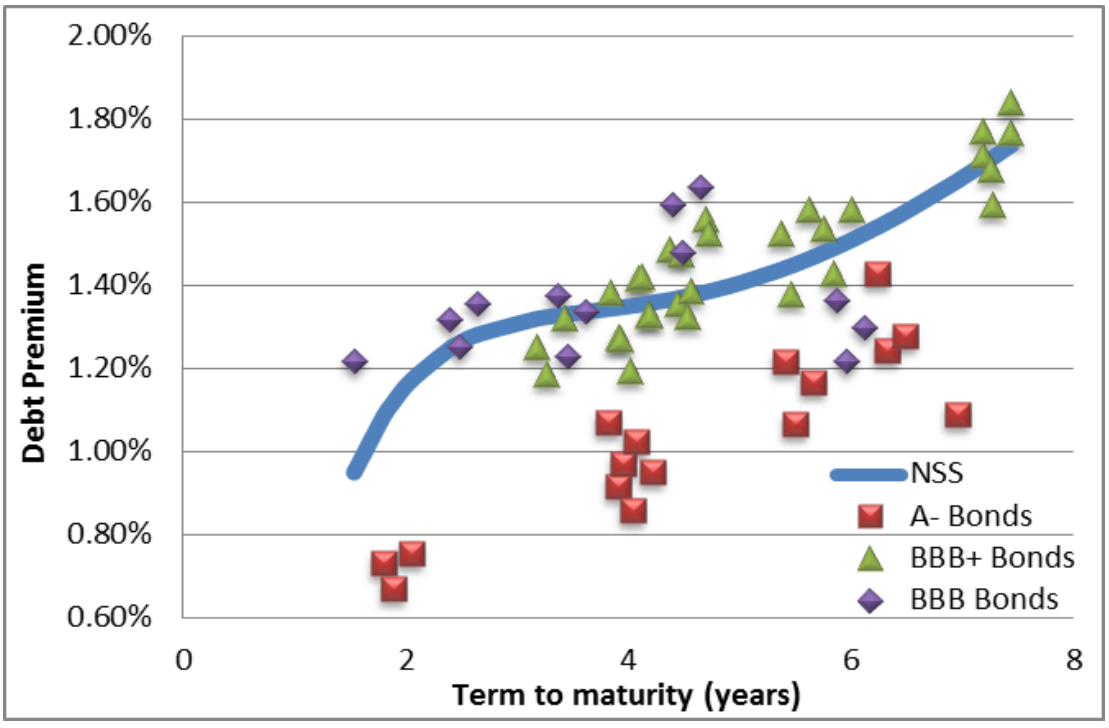


Figure 16: Adjusted NSS Curve (Oct 2015 – Jan 2016)



701. In Figure 16, the yield curve is estimated adjusting for differences in credit rating using dummy variables on credit rating (formula 2). This adjusted yield curve estimates higher debt BBB+ debt premiums for a given term to maturity compared to the non-adjusted yield curve.

702. The estimates of the five-year debt premium also differ between approaches; the non-adjusted curve has an estimated debt premium of 1.33% while the adjusted curve has a debt premium of 1.41%.

Table 33: Summary statistics for the sample with dummy variables (BBB, BBB+ and A-)

Month	5-year estimate	R-Squared	RMSE	Sum of residuals squared
January 2016	1.49%	0.73	4.94E-06	6.13E-05
December 2015	1.38%	0.57	8.20E-06	6.59E-05
October 2015	1.51%	0.61	1.05E-05	1.16E-04
Average	1.46%	0.64	7.88E-06	8.11E-05

703. Expanding the sample to cover BBB, BBB+, and A- bonds and using dummy variables results in lower R^2 values compared with the averaging and BBB+ only samples. This is expected given the inclusion of outer-rated bonds. However, the estimated BBB+ debt premium using the BBB+ only dataset (using formula 1) and the expanded dataset (using formula 2) are the same. The Root mean square error (**RMSE**) is also slightly larger with the expanded sample.

Figure 17: Adjusted NSS Curve (Jan 2015 – Jan 2016)

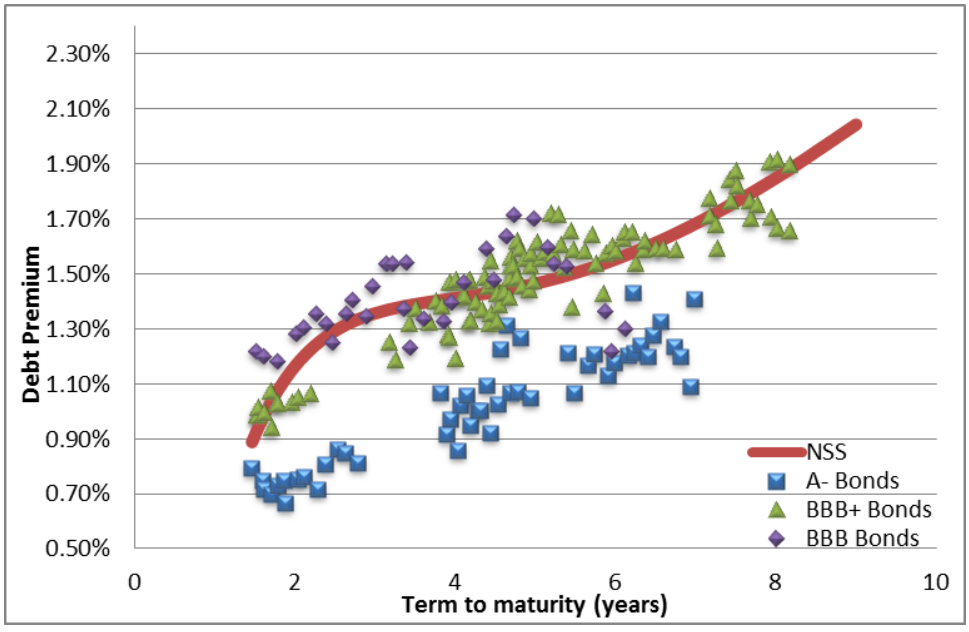
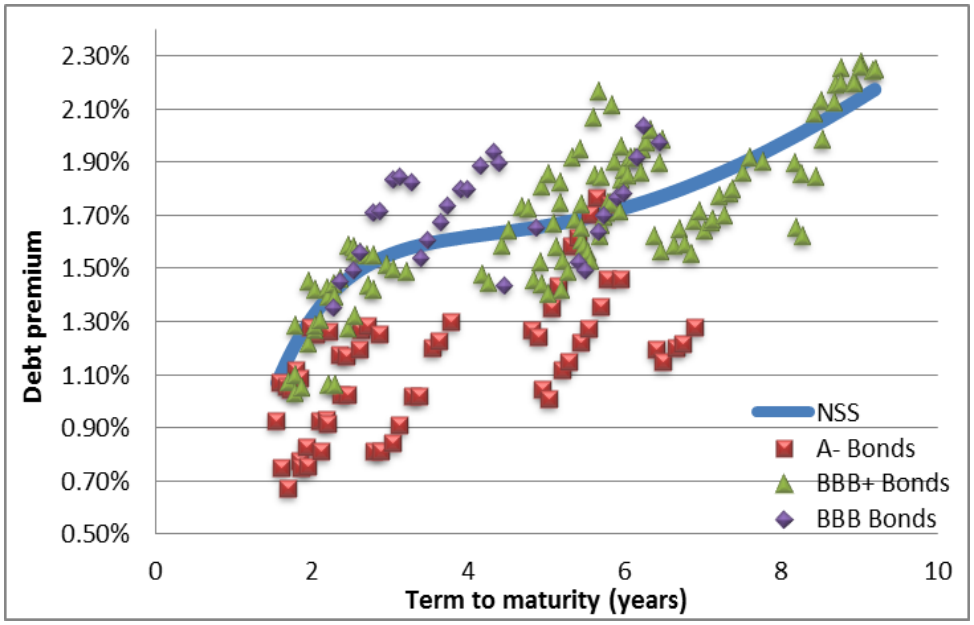


Figure 18: Adjusted NSS Curve (Jan 2014 – Jan 2015)



704. Figure 17 and Figure 18 demonstrate the debt premium curves spanning a year of observations and adjusted for credit rating using dummy variables. The parameters values used to generate the curves are also presented. Both annual yield curves have the same general shape and positioning of differently rated bonds.

705. It is interesting to note that the parameter values used in the model are very similar from one year to the next. This indicates for longer periods of data; the parameters used in the model show evidence of being stable (refer to Table 34 for parameter values). When compared with individual monthly parameter values, there can be significant differences (as monthly curves can fluctuate between curve shapes).

706. Stable annual parameter values suggest a consistent yield curve shape when using long averaging periods. When continuing with estimations, annual data is too long to be considered relevant at a point in time – the observations from 12 months ago would likely not be applicable to current estimations.

707. The Nelson-Siegel model appears useful for our bond data; the functional form allows for flexibility to take on many different curve shapes. Therefore the curve is able to be fitted to the data rather than enforcing a shape that may not be consistent with our data set of sample bonds. The Svensson extension allows for further flexibility of the curve to cater for different sets of data and different yield curve shapes.

Example of an estimation

Figure 19: EDB/GPB NSS Curve (Jan – Mar 2016)

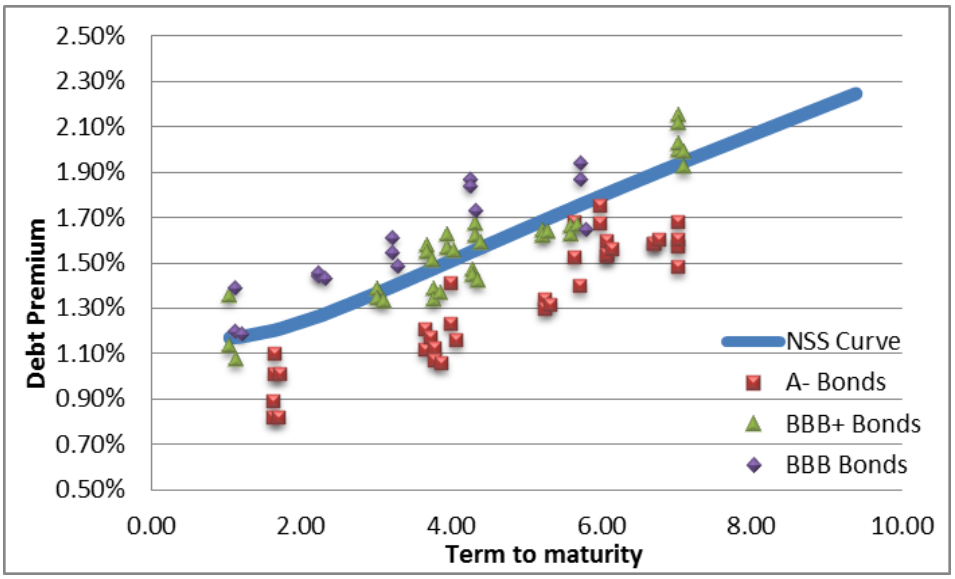
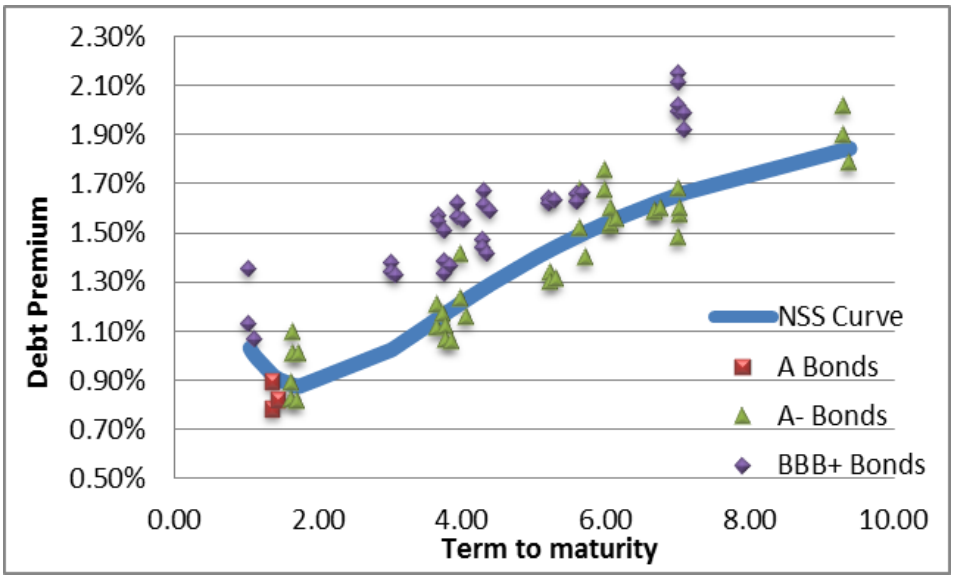


Figure 20: Airport NSS Curve (Jan – Mar 2016)



708. Figure 19 and Figure 20 demonstrate the estimation of the debt premium for a three-monthly averaging period for the EDB/GBP and airport sectors. The EDB/GPB determination includes BBB, BBB+ and A- rated bonds to determine the BBB+ debt premium. The airport determination includes BBB+, A- and A rated bonds to estimate the A- debt premium.

Table 34: Parameter values for different averaging periods

Parameters	EDB/GPB Jan 2015 – Jan 2016	EDB/GPB Jan 2014 – Jan 2015	EDB/GPB Jan – Mar 2016	Airport Jan – Mar 2016
β1	-13.58	-13.45	-0.056	-0.0020
β2	13.56	13.43	0.069	0.025
β3	-9.20	-9.09	-8.72	-13.49
β4	0.079	0.082	-0.0088	-0.049
β5	0.00038	0.00039	0.0015	0.0027
β6	-0.0036	-0.0036	-0.0029	-0.00084
λ1	-3611.24	-3723.43	-3797.60	-158281
λ2	1.16	1.26	1.19	1.02

709. Table 34 shows the parameter values for different averaging periods for estimating the debt premium term structure using formula 2. The annual averaging periods have very similar parameter values, and the three-month averaging periods are also comparable.

710. With different bond samples, the framework is optimised such that there are different parameter estimates – leading to different NSS curve shapes. The five-year estimates were consistent with the Commission estimates using the current approach.

Nelson-Siegel-Svensson: Strengths, weaknesses and assumptions

Overview of strengths and weakness:

711. Strengths:

711.1 can observe the debt premium at any term to maturity within the range of the curve (ie, bonds not observable in the market);

711.2 can generate relatively robust estimations from the yield curve with limited observations;

711.3 strong theoretical foundations – proven to produce reliable results;

711.4 similar to methods used in other countries (specifically Australia) for use in estimating the debt premium;

711.5 the functional from of the NSS model was created to be capable of handling a variety of yield curve shapes that are observed in the market; and

711.6 easily replicable.

712. Weaknesses:

712.1 may be perceived as complex and not fully transparent due to the complicated functional form;

712.2 there are several assumptions that must be made in the NSS model; and

712.3 there could be a potential collinearity problem (however very unlikely).

713. The NSS approach appeared to give reliable estimations for all of the time period averages (even with the lack of bonds in individual months). The relatively constant parameters for longer-term averages indicate a dependable general shape of the yield curve. In terms of replicability; the NSS model applied here can be easily reproduced in an excel spreadsheet. However the monthly data would need to be manually added to the spreadsheet and formatted or a mechanical process adopted.

714. The Nelson-Siegel model (and Svensson extension) can occasionally be prone to a collinearity problem. Even with badly-conditioned models, we can still obtain small residual values (indicative of a well-fitting model). For many values of the parameter λ; the factor loadings can be highly correlated .[439] An example of the collinearity would be if λ_1 and λ_2 are approximately equal; therefore β_3 and β_4 will have the same factor loading and give two perfectly collinear regressors. Although collinearity like this is very unlikely, when forecasting; correlated regressors are not necessarily a problem. (Gilli, Grobe, & Schumann, 2010).

715. When generating the yield curves to estimate the debt premium, we have implicitly assumed that:

715.1 liquidity of bonds (on-the-run vs. off-the-run) would have an effect on the bid-yield to maturity and subsequent debt premium, but is not taken into account in the model';[440]

715.2 outer-rated bonds in the sample (BBB and A-) have the same yield curve shape as the BBB+ rated bonds; and

715.3 there is no significant difference between majority government-owned corporate bonds and private corporate bonds.

716. A three-month averaging period has been set as the time period for this paper. One month samples may lack robustness due to lack of bonds and an annual sample could include irrelevant data in the estimation. Incorporating dummy variables for

[439] Factor loadings represent how much a factor explains a variable.

[440] On-the-run bonds are newly issued bonds and generally exhibit a lower yield and higher price compared with a similar term to maturity (already out in the market) off-the-run bonds.

outer-rated bonds (A- and BBB) allows expansion of the bond sample while taking into account the differences from these bonds.

Attachment D: Analysis of the term credit spread differential

Purpose of this attachment

717. The purpose of this attachment is to provide further information on our proposed changes to the TCSD.

Adjustments to the term credit spread differential

718. We propose to make some adjustments to the TCSD applied in the IMs. As described in paragraphs 180 to 208 we consider that the policy intent for the TCSD remains valid, but the way that it has been implemented can be improved.

719. This attachment provides more information on why we consider that the approach to the TCSD can be improved and outlines the changes we propose:

    719.1 Firstly we consider why changes to the TCSD methodology could better implement the policy intent behind the TCSD.

    719.2 Secondly, we explain how we have determined a fixed relationship between original debt tenors and the additional debt premium associated with debt with a term over five years.

Issues with the current approach

720. The currents IMs determine a TCSD for qualifying suppliers that is calculated using a formula that combines:

    720.1 the additional debt premium associated with each issuance of debt that has an original term to maturity in excess of the five-year debt premium (the 'spread premium');[441]

    720.2 an allowance for swap costs; and

    720.3 a negative adjustment to take account of the lower per annum debt issuance costs that are associated with longer-term debt.[442]

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

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

721. The spread premium and the debt issuance adjustment are the most material elements of the TCSD. The debt issuance adjustment is a fixed relationship based on the current assumption of debt issuance costs. The debt issuance costs are currently assumed to be 0.35% p.a. for a five-year period. This formula is specified in the IMs and means that (proportionally) the impact will be the same for all debt that has the same original tenor. The debt issuance costs adjustment is calculated as:[443]

(0.0175 ÷ original tenor of the qualifying debt - 0.0035) × book value in New Zealand dollars of the qualifying debt at its date of issue

722. A different approach is undertaken for the spread premium. The spread premium is estimated by using Bloomberg data and is calculated by using the difference between:

722.1 the yield shown on the Bloomberg New Zealand 'A' fair value curve *minus* the New Zealand swap rate quoted by Bloomberg (for a tenor equal to the original tenor of the qualifying debt); and

722.2 the yield shown on the Bloomberg New Zealand 'A' fair value curve *minus* the New Zealand swap rate quoted by Bloomberg (for a tenor of five years).

723. These values are taken from Bloomberg on the date that the debt was originally issued.

724. Two issues have been raised with the current approach:

724.1 The New Zealand 'A' fair value curve is no longer published by Bloomberg;[444] and

724.2 The calculation requires four pieces of data, which are from daily Bloomberg estimates. As a result, calculating the difference between the corporate spread and the swap spread can lead to unstable results. The output can be very variable from day to day, and may not accurately reflect the real spread premium incurred by firms.

725. We were aware of the potentially for variability from this calculation when setting the IMs and so we applied a minimum and maximum value for the spread premium. This minimum value was set at 0.0015 and the maximum was set at 0.006.[445]

726. Figure 21 shows how the spread premium calculated by Transpower for its TCSD in 2015 is often at the minimum value. Similar outcomes can be seen for other suppliers that issue longer-term debt.

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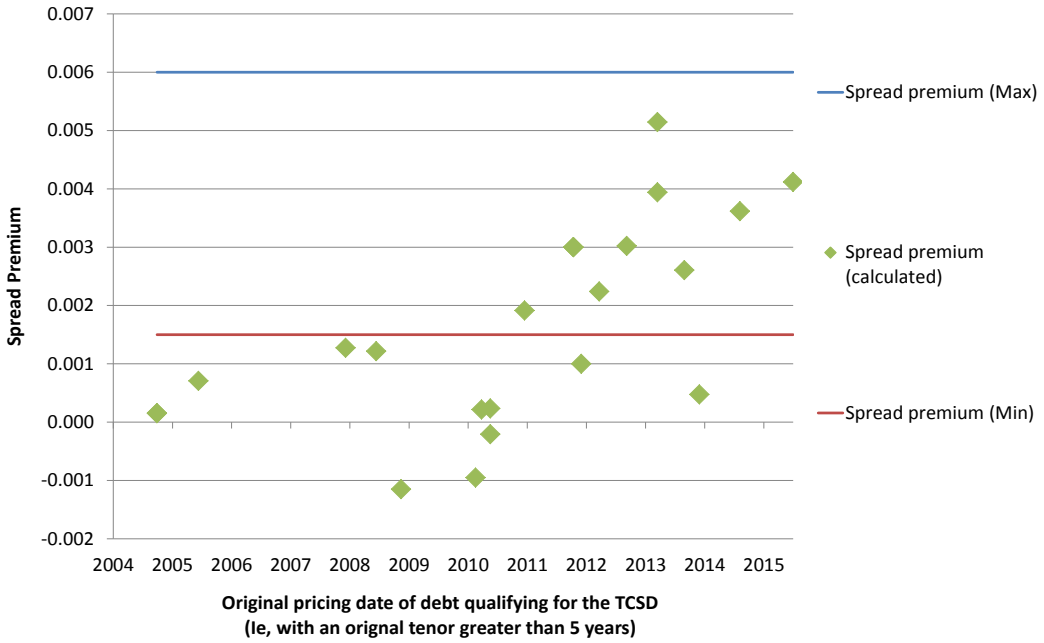
443 Electricity Distribution Services Input Methodologies Determination 2012 [2012] NZCC 26, clause 2.4.11.

444 Due to this issue we have amended the IMs for Transpower so that an alternative methodology can be applied. See: *Transpower Input Methodologies Amendment Determination 2015 (No.2)* [2015] NZCC [27].

445 For example, see: Electricity Distribution Services Input Methodologies Determination 2012 [2012] NZCC 26, clause 2.4.10.

Figure 21: Calculation of the spread premium for Transpower's 2015 TCSD

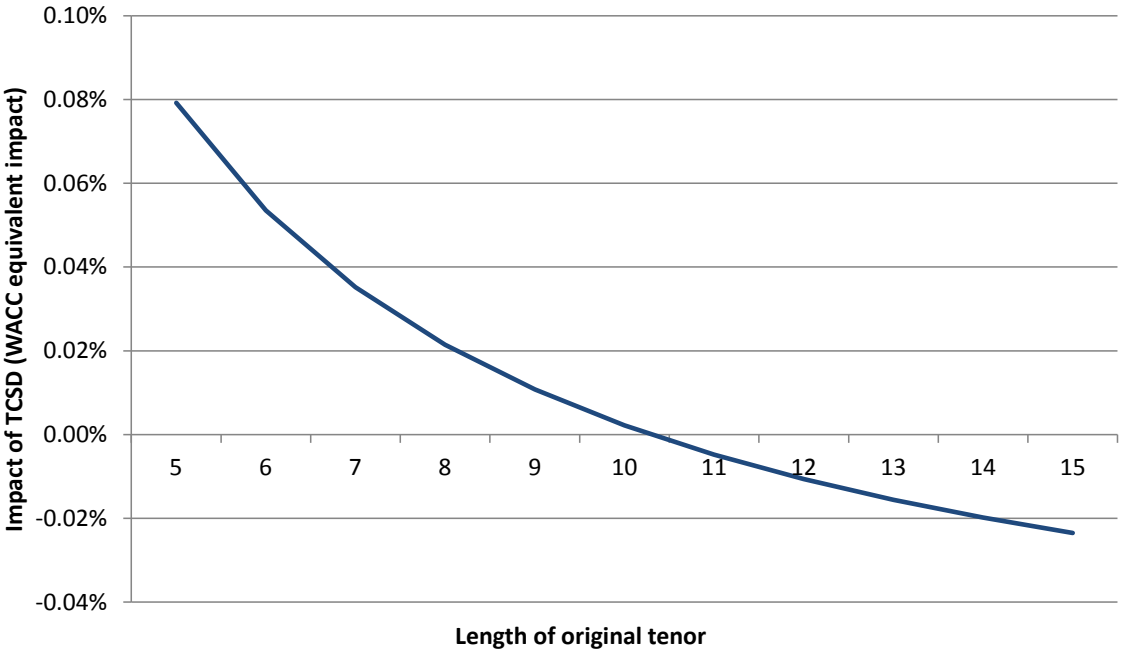


727. A problem arises when the spread premium is at the minimum value because when it is combined with the debt issuance cost adjustment it results in a decreasing allowance from the TCSD with increasing tenor.

728. Figure 22 shows this effect and how, when the minimum value for the spread premium is used, the TCSD reduces as original tenor increases.[446]

[446] Although Figure 22 shows a negative TCSD, the IMs limit the allowance to zero. Therefore the TCSD would never have a negative impact on a supplier's revenue allowance.

Figure 22: Decreasing TCSD with increasing original tenor for a spread premium at the minimum value of 0.0015



729. For this relationship to be correct it relies on a greater impact from the reduction in per annum debt issuance costs than the increase in the spread premium from issuing debt with a longer original tenor. However, because of the variability in the data, it is difficult to determine the appropriateness of our current approach.

Proposed approach

730. We consider that a more appropriate methodology would be to determine a fixed positive relationship between original tenor of issued debt and the additional spread premium.[447] The benefits of this revised approach would be to:

730.1 No longer require the use of the Bloomberg fair value 'A' Curve;

730.2 Reduce the complexity and administrative burden of the current approach because firms would no longer need to obtain market information on corporate bond yields or the interest rate swap rate;

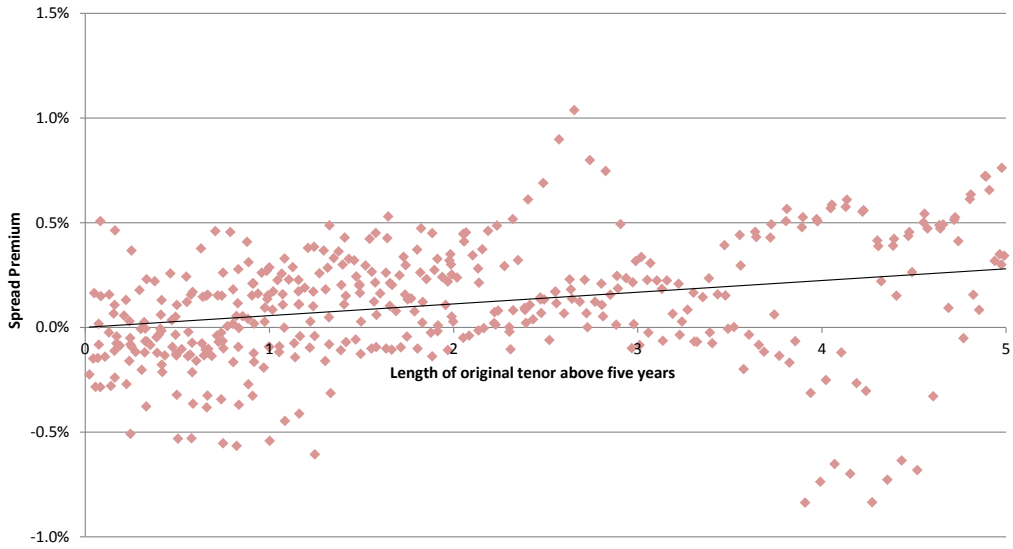
730.3 Provide a positive relationship between the length of debt and the additional TCSD allowance. This is consistent with our consideration that the issuance of longer-term debt provides long-term benefits to consumers (due to reduced refinancing risks).

[447] The TCSD would also no longer provide an allowance for the costs of executing an interest swap, because the costs of swaps would be considered as part of the allowance for debt issuance costs.

731. The fixed relationship was determined by analysing the observed spread premiums for NZ domestic vanilla bonds since 2010 with remaining tenor greater than five years and an estimate (using interpolation) of the equivalent government bond rate.

732. Using this data we fitted a linear slope to the data points associated with a specific credit rating.[448] The slope is shown in Figure 23 for BBB+ rated bonds. A similar approach was undertaken for A- rated bonds.

Figure 23: Observed relationship between spread premium and length of tenor for BBB+ rated bonds (2010-2016)



733. The linear relationships estimated from this process are:

BBB+ bonds: spread premium = 0.000559 × (original term of the qualifying debt – 5)

A- bonds: spread premium = 0.000172 × (original term of the qualifying debt – 5)

734. We consider that using a linear slope is the most appropriate methodology to determine the spread premium required for the TCSD equation, rather than an alternative like a fitting a NSS curve.[449] This is because:

734.1 it is straightforward to implement; and

734.2 there are difficulties in fitting an NSS curves to the limited data points that we have on debt premiums greater than 7 years – this is particularly relevant for A- bonds.

735. In addition to the additional credit 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.

448 The intercept of the linear slope was set to zero.

449 NSS curves are discussed in more detail in Attachment C.

736. We consider that the issuance costs are fixed, therefore regardless of the debt term, the required adjustment can be calculated based on our proposed allowance of 0.20% p.a. issuance costs for debt with a 5-year original term. Table 35 provides the lower debt issuance costs associated with debt that has a longer original tenor and also how this translates to a debt issuance costs adjustment as part of the TCSD calculation.

Table 35: Debt issuance costs adjustment factor

Tenor	**5**	**6**	**7**	**8**	**9**	**10**
Issuance costs (0.2% × 5/tenor)	0.20%	0.17%	0.14%	0.13%	0.11%	0.10%
Debt issuance adjustment	0.00%	-0.03%	-0.06%	-0.07%	-0.09%	-0.10%

737. From combining credit spread premium and the issuance costs adjustment, a fixed relationship between the term of issued debt and the TCSD can be determined

Table 36: TCSD adjustment for different original tenor length (EDBS, GPBS and Transpower)

Tenor	**5**	**6**	**7**	**8**	**9**	**10**
Spread premium	0.00%	0.06%	0.11%	0.17%	0.22%	0.28%
Debt issuance adjustment	0.00%	-0.03%	-0.06%	-0.07%	-0.09%	-0.10%
TCSD premium	**0%**	**0.03%**	**0.05%**	**0.10%**	**0.13%**	**0.18%**

Table 37: TCSD adjustment for different original tenor length (Airports)

Tenor	**5**	**6**	**7**	**8**	**9**	**10**
Spread premium	0.00%	0.02%	0.04%	0.06%	0.07%	0.09%
Debt issuance adjustment	0.00%	-0.03%	-0.06%	-0.07%	-0.09%	-0.10%
TCSD premium	**0%**	**-0.01%**	**-0.02%**	**-0.01%**	**-0.02%**	**-0.01%**

738. To incorporate the TCSD formula for energy businesses in the IMs we propose to:

738.1 provide a formula in which the input would be the original term of the relevant debt issuance – This input would not need to be rounded;

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

738.3 set the maximum term allowed in the calculation to be 10 years; and

738.4 apply those values to any qualifying debt in the same manner as the present TCSD.

739. The benefit compared to the current approach is that using a fixed value will simplify both the calculation of the TCSD and ensure that it always increases with the term of qualifying debt

740. The data also suggests that on average the spread premium of A- bonds does not outweigh the benefits from a reduction in the per annum issuance costs As a result we propose not to provide an TCSD for airports because if we did the allowance would be zero (or negative).[450]

[450] Note that the TCSD for airports is provided in the information disclosure determination, not the input methodologies determination. We propose that this determination is updated to reflect any change to the TCSD at a later date.

Attachment E: Materiality of dual WACC approach

Purpose of this attachment

741. The purpose of this attachment is to discuss the materiality of the dual WACC approach discussed in Chapter 6.

Dual WACC option

742. We describe in Chapter 6 the potential for perverse incentives with our current approach for determining a CPP WACC.

743. Our proposal is to apply the DPP WACC for CPPs. However, one alternative option suggested is to introduce a dual WACC approach in which a different WACC is applied to different types of capex under the CPP. Advice from Dr Lally recommended this option because it minimises the identified incentive issues.[451]

744. Submissions from suppliers did not recommend the dual WACC approach suggesting there are some implementation issues and that it adds complexity to the regime.[452]

Explanation of the Dual WACC approach

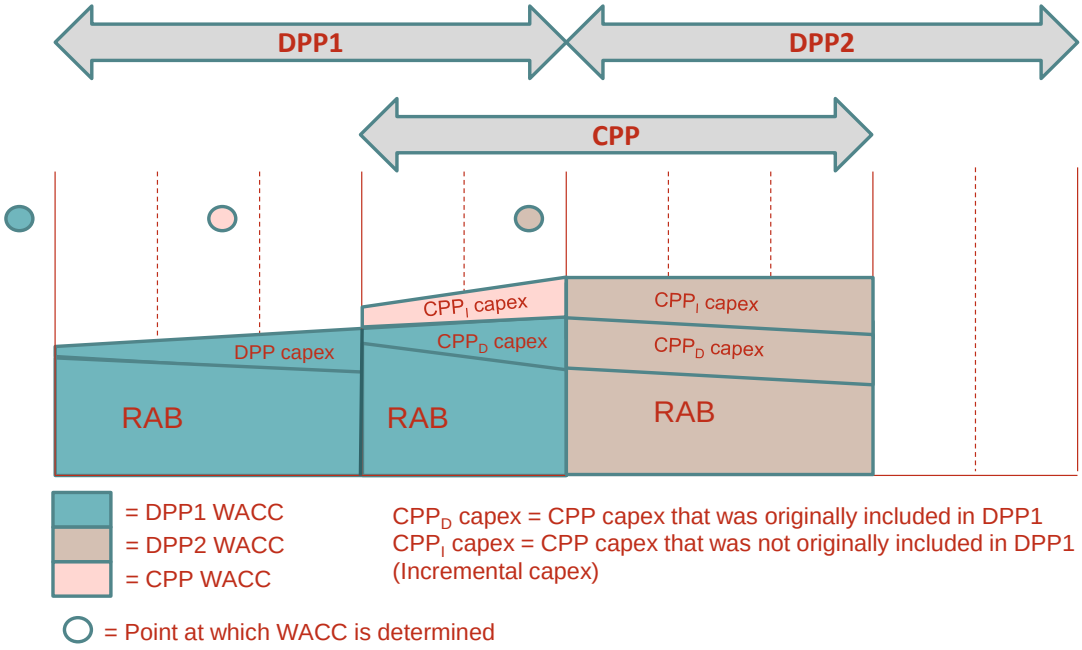
745. The dual WACC approach applies a different WACC to different types of capex and the existing asset base. Figure 24 provides an illustration of how this might work in practice. The capex allowance under the CPP can be split into two categories, capex that was originally allowed for under a DPP and 'incremental capex' that is the additional capex provided for under a CPP.

746. There are two variants of the dual WACC approach. The first variant (shown in Figure 24) applies the CPP WACC to incremental capex until the end of the DPP. A second variant applies the CPP WACC to incremental capex until the end of the CPP.

451 Dr Martin Lally "Complications arising from the option to apply for a CPP" (18 September 2015).

452 For example see: PwC (on behalf of 19 Electricity Distribution Businesses) "Submission to the Commerce Commission on input methodologies review: Update paper on the cost of capital" (5 February 2016), para 20; Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 53.

Figure 24: Implementation of a dual WACC approach



747. Under the first variant, the CPP WACC would be applied to additional capex approved during the CPP process (incremental capex), while the DPP WACC is applied to the RAB and the CPP capex that was originally included under the DPP. At the reset of the DPP, the new DPP WACC would apply to the RAB and future capex.

748. We consider that this type of approach can be implemented. However the difference in return on capital associated with applying a CPP WACC to incremental capex is likely to be a small element of the total return on capex. This needs to be considered when assessing the benefits of the dual WACC approach.

749. The materiality can be assessed by evaluating an example of the type of circumstances in which the dual WACC approach might be applied. One possible scenario would be that:

749.1 incremental capex under a CPP (ie, additional capex above that which was allowed under a DPP) is equivalent to 5% of RAB over the CPP period;[453] and

749.2 the CPP applies for three years before the DPP WACC is reset.[454]

750. If the incremental capex is 5% per year for three years, then the return on capital determined from the CPP WACC would be 10% of the total return on capital for

[453] We expect this would be at the high end of potential step-changes under a CPP.

[454] We consider three years is appropriate because the CPP WACC is currently determined prior to a CPP application, which can be more than a year before the CPP starts. This means that any CPP that starts in the first or second year of a DPP is likely to have a CPP WACC equivalent to the DPP WACC or one that was determined prior to the DPP WACC. However in year 3 a CPP WACC could be significantly differently to the DPP WACC.

those three years.[455] The average over the five-year DPP regulatory period would be 6%.[456]

751. We can also assume that the return on capital is approximately 30% of the total revenue allowance for the period and that the difference between the CPP WACC and DPP WACC is one third (eg, a 2% reduction from 6% to 4%).

752. Over the five-year period the impact on revenues would be:

Impact on price path ≈ % revenue from the return on capital × % of return on capital from Incremental CPP capex × change in WACC value

Impact on price path ≈ 30% × 6% × 33%

Impact on price path ≈ 0.5%

753. This hypothetical example illustrates the potential materiality of the dual WACC approach on the price path. Given the relatively high assumptions for incremental CPP capex and the change in the WACC, we consider a 0.5% impact is at the high end of possible outcomes.

754. Applying a dual WACC option would also require us to calculate a CPP WACC based on debt terms that are consistent with the time period to the next DPP reset. For example, if the CPP commences one year prior to the reset of the DPP then the CPP WACC would be estimated using a risk-free rate and debt premium that applies for one year. This further complicates the approach.

755. The second variant of the dual WACC approach would be to apply the CPP WACC to CPP incremental capex until the end of the CPP, rather than until the start of the new DPP period. This approach would increase the materiality of the dual WACC approach but would increase the complexity. It would require us to maintain a differential between different types of capex for a longer period of time. As a result we do have not considered this variant of the dual WACC approach in detail.

756. After considering the materiality on the price path, our view is that a dual WACC approach would not be appropriate for a CPP given the complexity costs associated with it and limited impact it is likely to have on investment incentives.

757. We consider that the existing DPP WACC should be applied to both the existing RAB and all new capex under a CPP. When the DPP WACC changes the new DPP WACC would be applied to the CPP path.

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[455] In the first year the CPP WACC applies capex equivalent to 5% of RAB. In the second year the CPP applies to the capex equivalent to 10% of RAB (5% from the first year and 5% from the second year). In the third year the CPP applies to the capex equivalent to 15% of RAB (5% from the first year, 5% from the second year and 5% from the third years). Therefore, the CPP WACC will apply to about 10% of the total return on capital for the three years, ie, (5% + 10% + 15%)/3.

[456] 10% × (3/5) = 6%.

758. This approach would have the added benefit that the Commission would no longer need to estimate separate CPP WACCs.