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Input methodologies review decisions

Topic paper 4: Cost of capital issues

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Associated documents

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20 December 2016	978-1-869455-44-6	Input methodologies review decisions: Introduction and process paper
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20 December 2016	978-1-869455-45-3	Input methodologies review decisions: Topic paper 1 – Form of control and RAB indexation for EDBs, GPBs and Transpower
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20 December 2016	1178-2560	*Electricity Distribution Services Input Methodologies Amendments Determination 2016* [2016] NZCC 24
20 December 2016	1178-2560	*Gas Distribution Services Input Methodologies Amendments Determination 2016* [2016] NZCC 25
20 December 2016	1178-2560	*Gas Transmission Services Input Methodologies Amendments Determination 2016* [2016] NZCC 26
20 December 2016	1178-2560	*Transpower Input Methodologies Amendments Determination 2016* [2016] NZCC 27
20 December 2016	1178-2560	*Airport Services Input Methodologies Amendments Determination 2016* [2016] NZCC 28
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Executive summary

Purpose of this paper

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

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

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

X1.3 the reasons for our 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 decisions 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 cost 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 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 updating our estimates of beta and leverage to reflect more up-to-date information of the observed beta and leverage for comparable companies;

X3.5 considering whether any adjustment to beta is required in light of our changes to the form of control for electricity distribution businesses (**EDB**s); and

X3.6 reviewing key parameter estimates such as tax adjusted market risk premium (**TAMRP**) in light of updated information.

X.4. Table X1 summarises the areas in this topic where our analysis has led us to changes to the IMs, and the reasons for those changes. As can be seen in the table, we have primarily made changes that we consider improve our estimate of a weighted average cost of capital (**WACC**) and ensure that it remains fit for purpose. A better estimate of WACC helps to promote the purpose of Part 4 (**Part 4**) of the Commerce Act 1986 (the **Act**) by ensuring that suppliers have appropriate incentives to invest. 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 changes in relation to the cost of capital compared to the pre-review IMs

Change	Outcomes of the change	Chapter
Continue to estimate the risk-free rate using prevailing rates, 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 using a one month determination window may have some distortionary effects if there are significant hedging activities by regulated suppliers, so we have increased the determination window to three months.	This change is discussed in Chapter 3.
Modify the debt premium methodology implementation by: • using a five-year historical average to estimate the debt premium, rather than the previous prevailing approach; • applying no annual updating; • retaining a five-year original term for the risk-free rate and debt premium estimates and by applying a TCSD; • relaxing the government ownership limitation on relevant bonds; and • having regard to the Nelson-Siegel-Svensson (**NSS**) curve.	We have decided it is appropriate to protect suppliers and consumers against significant temporary changes in the debt premium by applying a historical average. Relaxing 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.	This change is discussed in Chapter 3.

Change issuance costs from 35 basis points (**bps**) (0.35%) p.a. to 20 bps (0.20%) p.a.	We consider, on the basis of the evidence now available, that an allowance for debt issuance costs of 20 bps is appropriate to cover the costs of issuing NZ domestic corporate bonds and the costs of any required swaps.	This change is discussed in Chapter 3.
Remove an allowance for swap costs from the TCSD and include it as part of the debt issuance costs.	Reduces the administrative burden on suppliers.	This change is discussed in Chapter 3.
Change the asset beta for EDBs and Transpower from 0.34 to 0.35.	This reflects updated comparator sample analysis.[1]	This change is discussed in Chapter 4.
Change the asset beta upwards adjustment for GPBs – from 0.10 to 0.05. Therefore, change the asset beta estimate for GPBs – from 0.44 to 0.40.	Based on additional evidence, we now consider an uplift of 0.05 is appropriate, rather than the previous uplift of 0.10.	This change is discussed in Chapter 4.
Change the leverage estimate for EDBs and GPBs – from 44% to 42%.	We have updated our estimates of leverage to reflect more up-to-date information of the observed leverage for comparable companies.	This change is discussed in Chapter 4.
Change the leverage estimate for airports – from 17% to 19%.	We have updated our estimates of leverage to reflect more up-to-date information of the observed leverage for comparable companies.	This change is discussed in Chapter 4.

[1] Note that our estimate for asset beta has been updated since the draft decision due a correction of spreadsheet errors for weekly estimates, and minor refinements to the comparator sample in response to submissions.

Retain the TCSD allowance for energy businesses but remove for airports. Modify the methodology of the TCSD so that it uses a fixed linear relationship to determine the additional debt premium associated with debt issued with an original maturity term of more than five years.	The TCSD has been removed for airports because the additional TCSD allowance for bonds with an original tenor longer than five years is offset by a consequential reduction in debt issuance costs. For energy businesses we have estimated a (positive) fixed linear relationship between the TCSD allowance and the original tenor of the debt, from historical market data. This ensures that the intent of the TCSD (that additional compensation is provided for issuing longer-term debt) is met. The revised approach removes the requirement on suppliers to obtain market pricing information associated with individual debt issuances when estimating the TCSD, which reduces the complexity of the TCSD.	This change is discussed in Chapter 3.

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

X5.1 a summary paper of our decisions;

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

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

X5.4 a Report on the IM review, which records our decisions on whether and how to change the IMs as a result of the IM review overall; and

X5.5 amendment determinations, which give effect to our decisions.

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 responses to these issues, which include changes to the input methodologies (**IM**s);

    1.3 the reasons for our 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 views presented in this paper.

Where this paper fits in to our package of decisions papers

2. This topic paper forms part of our package of 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 decision package.[2]

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

4. To the extent our approaches involve changes to the IMs, this paper explains how we have changed our previous IM decisions to account for issues within this topic area. The report on the IM review then collates our changes to the previous IMs and presents them as decisions to change the IMs.[3]

5. Our drafting changes to the IMs, including any resulting from this topic area, are shown in the amendment determinations.

6. The framework we have applied in reaching our decisions on the IM review is set out in a separate paper, published alongside this paper.[4] The framework paper explains that we have only changed the IMs where this is likely to:

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

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2 Commerce Commission "Input methodologies review decisions: Introduction and process paper" (20 December 2016).

3 Commerce Commission "Input methodologies review decisions: Report on the IM review" (20 December 2016).

4 Commerce Commission "Input methodologies review decisions: Framework for the IM review" (20 December 2016).

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 have made 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 have updated the other cost of capital parameters in that section.

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

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 weighted average cost of capital (**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,[5] cost of capital update paper,[6] and the High Court's comments in the 2010 IM judgment.[7] We have sought to address these issues and detail our approaches at the beginning of each chapter.

12. Dr Martin Lally has provided us with advice on a number of cost of capital issues including the cost of debt, asset beta adjustments, the tax adjusted market risk

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

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

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

premium (**TAMRP**), Regulated Asset Base (**RAB**) indexation and inflation risk. We published his two reports, one in February,[8] and one in May,[9] and considered his advice and the submissions we received on that advice, when forming our draft decisions. Dr Lally has also provided us with further advice on these issues, which has helped us form our decisions, and we have published his latest report alongside this topic paper.[10]

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.[11] 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.

8 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).

9 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).

10 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016).

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

Chapter 2: Context

Purpose of this chapter

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

    15.1 the WACC;

    15.2 our previous IM for estimating the cost of capital and its key parameters;

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

    15.4 our review of the cost of capital IM, including our review of the issues identified by the High Court and the changes we have made.

What is the weighted average cost of capital?

16. 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.

17. Our WACC estimates are used in conjunction with regulatory asset values to determine the return on capital for each supplier subject to price-quality path regulation. The return on capital is one component of the building blocks allowable revenue for each supplier.

18. 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.

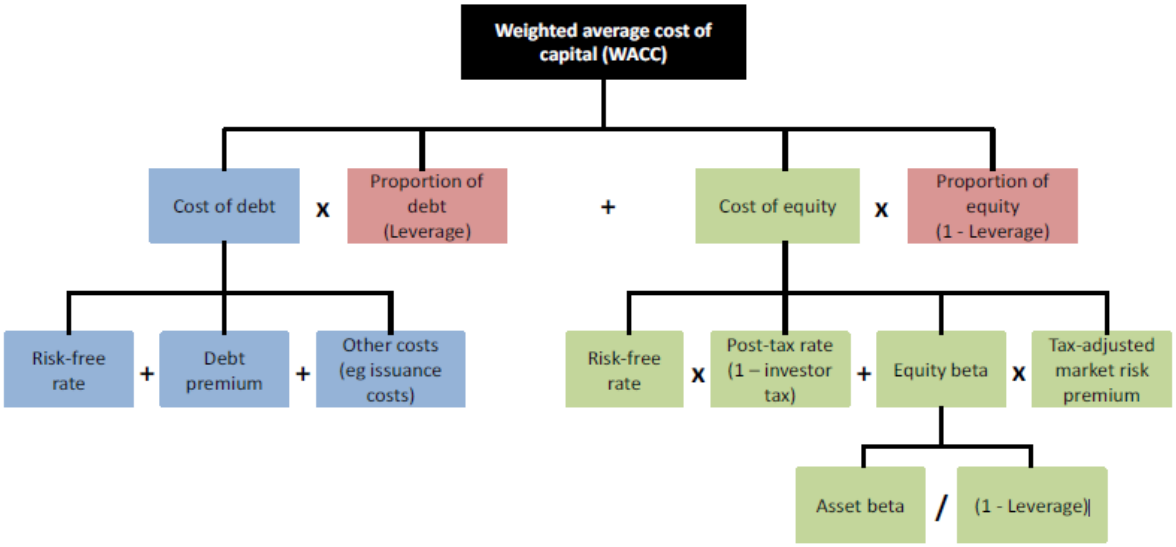
    Post-tax WACC = cost of debt (after tax) x leverage + cost of equity x (1 - leverage)

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

19. 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.

20. A number of parameters must be calculated to derive our estimates. These are as set out in Figure 1, below.

Figure 1: WACC and its parameters



21. 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.

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

23. 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.

24. If suppliers of a regulated service have similar exposure to systematic risk to each other, 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.[12]

25. 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

[12] Further discussion on the exposure of suppliers to systematic risk is provided in Chapter 4.

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?

26. Our cost of capital IM comprises two parts.

    26.1 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.

    26.2 The second component is the term credit spread differential (**TCSD**) (explained in paragraph 52), which is treated as a separate component because it will apply to qualifying firms only.

27. 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?

28. 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.

29. 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.

30. 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.

31. 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 cost of capital IM estimates these parameters below.

32. 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.[13]

33. The final part of our review is to conduct reasonableness checks to test whether our 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,[14] and the 2014 WACC percentile reasons paper.[15]

Cost of debt

34. 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 legal fees), and the cost of entering interest rate swaps to shorten the term of part of the cost of debt and better align it to the length of the regulatory period.

35. Our estimate of the cost of debt comprises three parameters:

    35.1 the risk-free rate;

    35.2 the debt premium; and

    35.3 debt issuance costs.[16]

36. 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 trading on the debt market.

37. 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

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13 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 error for airports information disclosure regulation, rather than the 25th to 75th percentiles.

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

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

16 We have included an allowance for swap costs as part of debt issuance costs.

risks of default in lending to a firm, plus an allowance for the inferior liquidity of 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.

38. 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.

39. 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.

40. Firms are able to manage movements in the risk-free rate by using an interest rate swap. An interest rate swap enables a supplier, if it wishes, to cover the cost of aligning the interest rate setting to the price setting. We consider that some degree of hedging activity by suppliers can be beneficial to consumers, as it can enable suppliers to both reduce their risk exposure and lower interest costs (to the extent that it reduces the term over which suppliers have fixed interest payments). We have therefore included an allowance for the costs of entering interest rate swaps, as part of the debt issuance costs.

Cost of equity

41. Equity is the second main source of capital. The difficulties in estimating the cost of equity are greater than in estimating the cost of debt.[17] The cost of equity, and most of its components, cannot be directly observed, so they have to be estimated based on an analytical model.

42. 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.

43. 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.

[17] The cost of equity, expressed as a rate of return, is the discount rate implicit in the price at which 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.

44. 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.

45. 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.

46. 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).

47. 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**).

48. 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).

49. Historic 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 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.

Other WACC parameters

50. 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.

51. 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?

52. The cost of capital IM includes a TCSD allowance to compensate suppliers for the additional debt premium that can be incurred from issuing debt with a longer original tenor than the five-year regulatory period.

53. 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.

54. The TCSD is calculated by way of a formula that combines: [18]

    54.1 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');[19]and

    54.2 a negative adjustment to take account of the lower per annum debt issuance costs that are associated with longer-term debt.[20]

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

55. 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.

56. The cost of capital IM plays a significant role in promoting the s 52A purpose.[21] 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.[22]

57. Due to the estimation difficulties described at paragraph 28, determining a cost of capital IM that estimates a cost of capital which is neither too high, nor too low, so

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18 As discussed in Chapter 3, we have modified the methodology of the TCSD as part of this review.

19 This debt is called 'qualifying' debt.

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

21 For a more detailed discussion of the s 52A purpose see: Commerce Commission "Input methodologies review decisions: Framework for the IM review" (20 December 2016).

22 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.

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.

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

Our review of the cost of capital IM

59. 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.

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

    60.1 the appropriateness of using the 75th percentile of the WACC in price-quality regulation;[23]

    60.2 the suitability of using the SBL-CAPM to estimate the cost of capital given the 'leverage anomaly', and whether alternative approaches could be considered;[24]

    60.3 whether a TCSD is required;[25] and

    60.4 to consider Major Electricity User's Group (**MEUG**)'s suggestion of a split cost of capital approach whereby a higher WACC is applied to new investment.[26]

61. We considered the High Court's scepticism about the rationale for the 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.

62. 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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23 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1486].
24 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1594-1661].
25 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1288].
26 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1486].

sectors from the 75th to 67th percentile.[27] The rationale for the amendment and the reasons for the change can be found in the final reasons paper for that amendment.[28] We have seen no evidence since the completion of the percentile amendment that indicates that we should change the percentile used.[29]

63. 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 approach, which is discussed in Chapter 6, is to remove the requirement to determine a CPP-specific WACC.

64. We have updated the asset betas for EDBs, GPBs, Transpower and regulated airports by following largely the same approach as in 2010. We updated the comparator samples used, and the time periods considered, to reflect additional data not available in 2010. As discussed in Chapter 4, we have adopted an unadjusted asset beta of 0.35 for EDBs and Transpower, an adjusted asset beta of 0.40 for GPBs, and an adjusted asset beta of 0.60 for airports.

65. 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 made no adjustment for regulatory differences for EDBs, GPBs, Transpower and airports. Also discussed in Chapter 4, we have reduced the asset beta uplift for GPBs from 0.10 to 0.05.

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

67. 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 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 will not use BSDR as a cross-check on the WACC until some of the identified issues have been resolved.

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27 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.

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

29 The October 2014 WACC percentile amendment did not consider the WACC percentile range that was applied to airports. We have therefore reviewed the impact on airports as part of the current IM review and our decisions in this area are provided in Topic paper 6. Commerce Commission "Input methodologies review decisions: Topic paper 6 – WACC percentile for airports" (20 December 2016).

68. Having conducted our review, we have made the following changes to the cost of debt:

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

    68.2 modified the debt premium methodology implementation by:

        68.2.1 using a historical approach that uses an average of five years of debt premium estimates;

        68.2.2 constraining the government ownership limitation on comparator bonds to those which are 100% government-owned (rather than majority government-owned); and

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

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

    68.4 removed an allowance for swap costs from the TCSD and included it as part of the debt issuance costs.

69. We have made the following changes to the cost of equity:

    69.1 changed the asset beta estimate for EDBs and Transpower – from 0.34 to 0.35;[30]

    69.2 changed the asset beta estimate for GPBs – from 0.44 to 0.40 (because we have changed the asset beta adjustment for GPBs – from 0.10 to 0.05);

    69.3 changed the leverage estimate for EDBs, Transpower, and GPBs – from 44% to 42%; and

    69.4 changed the leverage estimate for airports – from 17% to 19%.

70. We have made the following implementation change to the TCSD:

    70.1 used 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;

    70.2 no longer included an allowance for swap costs as part of the TCSD; and

[30] We have also changed the standard error of the asset beta for EDBs and Transpower from 0.13 to 0.12, and the standard error of the asset beta for GPBs from 0.14 to 0.12.

70.3 removed the TCSD for airports.[31]

71. We will no longer publish a 25th and 75th WACC percentile estimate for airports. The change is to calculate a mid-point WACC estimate for the quarters that do not align with WACC estimates currently calculated for ID. We will publish these additional estimates either when requested by an airport, or after an airport's price setting event. This issue is discussed in Topic paper 6.[32]

72. Most of our changes are because we consider that they enable us to better 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 better cost of capital estimate promotes the s 52A purpose.

73. We have also made a number of our 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.

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

[32] Commerce Commission "Input methodologies review decisions: Topic paper 6 – WACC percentile for airports" (20 December 2016).

Chapter 3: Cost of debt

Purpose of this chapter

74. The purpose of this chapter is to explain our decisions on the main issues raised in relation to the cost of debt, including any changes we have made to both:

    74.1 the pre-review IMs; and

    74.2 our proposals in the draft decision and Technical consultation update paper (**TCUP**).[33]

Structure of this chapter

75. This chapter begins with a summary of the main changes to the IMs with respect to the cost of debt, including any changes to our position since the draft.

76. This chapter then discusses the key areas raised in the review of the cost of debt, and explains our decision on each aspect of those key areas. Each section of this chapter begins with the issues for energy businesses and then details any differences for airports.

77. The key areas covered in this chapter are:

    77.1 consideration of a trailing average approach to estimate the cost of debt;

    77.2 other aspects of our debt premium methodology;

    77.3 the TCSD;

    77.4 debt issuance costs; and

    77.5 other matters related to estimating the cost of debt.

Summary of changes to the pre-review IMs

78. Following consideration of submissions to our draft decision, a summary of the changes we have made to the pre-review IMs related to the cost of debt are:

    78.1 to keep the existing prevailing approach for determining the risk-free rate; but extend the determination window used from one month to three months;

[33] Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016); and Commerce Commission "Input methodologies review – Technical consultation update paper" (13 October 2016).

78.2 to use a simple historical average approach to determine the debt premium using five years of historical data. Under this historical averaging approach the debt premium estimates used in the five-year average will be obtained:

78.2.1 for future years from corporate bond rates of over a 12 month determination window;

78.2.2 for previous years from averaging the relevant debt premium estimates that we have previously determined and published using the methodology in the previous IMs;[34]

78.3 to modify the existing methodology used to estimate the debt premium, including:

78.3.1 a change to the restriction on using bonds from government-owned entities – we will now only apply the restriction to 100% government entities; and

78.3.2 to have regard to a secondary methodology, which determines a NSS curve based on the available bond data;

78.4 to adapt the calculation of the TCSD so that it provides a more consistent allowance for bonds with an original maturity term longer than five years; and

78.5 to reduce the component of the cost of debt that compensates for debt issuance costs from 35 bps (0.35%) p.a. to 20 bps (0.20%) p.a.

Key changes since the draft decision

79. We published our draft decision on the IM review in June 2016. After considering submissions and comments from the WACC workshop, we have made a number of changes to our draft decision on aspects of the IMs related to the cost of debt.

80. Changes made since the draft are as follows.[35]

80.1 A revised methodology for estimating the debt premium so that we use a five-year historical averaging approach, rather than the prevailing rate from one determination window.

[34] Further details on our historical average approach are provided in Attachment G.

[35] We also proposed a change to the treatment of debt issuance costs in our TCUP, whereby the debt issuance costs would be removed from the WACC and compensation would be provided in regulatory cash-flows. Following submissions we have now reverted to the draft decision to apply an allowance for debt issuance costs in the WACC. For details on the TCUP proposal see: Commerce Commission "Input methodologies review – Technical consultation update paper" (13 October 2016), Attachment A.

80.2 A retention of the restriction on using bonds issued by government-owned entities (for those with 100% government ownership). The draft decision was to remove the restriction entirely.

80.3 An increase in the 'spread premium' in the TCSD formula from 5.6 bps p.a. to 7.5 bps p.a.[36]

Consideration of a trailing average approach to estimate the cost of debt

81. This section considers whether to apply a trailing average approach to the cost of debt and various related issues. We explain our reasoning on various issues that have been raised that relate to the trailing average, including:

81.1 our reasons for retaining a prevailing approach to estimate the risk-free rate;

81.2 our consideration of issues that have been raised in relation to the use of the interest rate swap market to hedge a supplier's exposure to variability in the risk-free rate;

81.3 our reasons for applying a historical averaging approach to estimate the debt premium; and

81.4 our consideration of the impact of volatility in the risk-free rate from one period to another.

82. Our decision on the approach to estimating the cost of debt considers the many submissions received during the IM review on whether a prevailing approach or trailing average should be used. We have considered a number of variants of a trailing approach and also whether issues with the current approach can be mitigated through other means.

83. We have also received expert advice from Dr Lally on this issue, including a response to the various concerns raised by stakeholders in response to our draft decision.[37]

84. Following our consideration of these issues, we have decided to determine the cost of debt by:

84.1 using a prevailing approach to estimate the risk-free rate with a three-month determination window;

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[36] The spread premium is the additional allowance (per year of additional tenor) provided for qualifying debt with a longer original tenor than five years. For more details on the estimate of the spread premium see Attachment E.

[37] 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); Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016).

84.2 using a five-year historical average to estimate the debt premium, rather than the previous prevailing approach;[38]

84.3 applying no annual updating; and

84.4 retaining a five-year estimate for the original term of the risk-free rate and debt premium and by applying a TCSD.

Retention of the prevailing approach for the risk-free rate

85. We have retained the prevailing approach to estimate the risk-free rate element of the cost debt. We have maintained our view from 2010 that using prevailing rates enables firms to achieve a normal return on their investment, promotes the potential dynamic efficiency benefits of investment and, therefore, better promotes the Part 4 purpose.[39]

86. We have placed a strong emphasis on the different aspects of the Part 4 purpose in making our decision, including a supplier's incentives to make efficient investments.[40] Our view is that the relevant consideration for determining whether we are promoting outcomes consistent with those produced in workably competitive markets is whether firms can be expected to achieve a normal return on their investment. A normal return is expected when ex-ante the net present value of the investment and subsequent cash-flows equals zero using the WACC as a discount rate.[41]

87. Businesses are able to hedge their interest rate exposure for the risk-free rate using the interest rate swap market. Swaps can be used to fix a supplier's interest rate payments such that they broadly match the risk-free rate (which is set by us for the length of a regulatory period). This is despite year-by-year variations in market government bond yields (which we use as a proxy for the risk-free rate).[42]

88. The existence of this swap market, and the ability of suppliers to use it to hedge the majority of their interest rate exposure, means that there will be minimal violations

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38 Further details on our historical average methodology are found in para 138-149 and Attachment G.

39 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H.4.1.-H4.13.

40 Ie, incentives to innovate and invest; improvements in efficiency; sharing of efficiency benefits with consumers; and limited ability to extract excessive profits. See: Commerce Act 1986, part 52A (1).

41 The equivalence of the present value of revenues and present value of costs is often referred to by the term 'NPV=0', which recognises that if this equivalence holds, then the net present value (NPV) of the revenues less the costs is zero. We used the term NPV=0 extensively when originally setting the IMs in 2010.

42 Firms will not be able to completely hedge their exposure because the swap rates and the risk-free rate are not exactly the same and, as noted by Frontier, hedging requirements may be uncertain for investment undertaken during the regulatory period. Frontier Economics (report prepared for Transpower) memo on Dr Lally Appendix "Issues arising from Commerce Commission WACC Workshop" (26 October 2016), para 27-28.

of the NPV=0 principle in regard to the risk-free rate under a prevailing regime. The ability to use the swap market meant that this is the case *even* if firms undertake staggered debt issuances over a longer period of time.

89. Some suppliers disagreed with our view that a prevailing approach better promotes efficient investment than a trailing average regime. For example, Frontier (on behalf of Transpower) note that:[43]

> …a regulatory approach such as the TACD approach that aligns the regulatory allowance to efficient debt costs is likely to enhance, rather than deter, efficient investment.

90. However, this is not a unanimous view from suppliers. Despite supporting a trailing average approach, PwC (on behalf of 17 EDBs) note that one of its disadvantages is the effect on investment incentives:[44]

> We agree that a disadvantage of the trailing average approach is that it reduces the extent to which the WACC estimate reflects current market conditions, and hence that it alters the incentives for new investment.

91. We disagree with Frontier that a trailing average would enhance efficient investment. The main reasoning for Frontier's conclusion on this point appears to be that the prevailing approach is more volatile and uncertain than using a trailing average and it is this known volatility that deters investment.

92. While we would agree that there is likely to be more volatility under a prevailing approach from one regulatory period to the next, we consider that the expectation of returns provides a better investment signal. We therefore consider that using prevailing rates over historical rates provides more appropriate investment incentives.

93. We consider that a supplier can seek to manage volatility in the risk-free rate by using the interest rate swap market. This weakens the argument that the variability in the risk-free rate is a significant problem for suppliers.[45]

94. The risk-free rate has been lower than its historical average over the last five years, although it remains volatile.[46] This means some of the problems with a trailing average have been less apparent. In an alternative environment of increasing interest rates we consider that it is likely to be harder for firms to invest without an allowance consistent with the prevailing risk-free rate. If a trailing average was in

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43 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 22-23.

44 PwC "Submission to the Commerce Commission on input methodologies review: Draft decisions papers – Made on behalf of 17 Electricity Distribution Businesses" (4 August 2016), para 268.

45 However, we note there is a separate issue on whether how this volatility affects the price paid by consumers. We cover this issue in para 134-137.

46 For example, see Figure 2.

place under such circumstances we would expect suppliers to ask for an allowance more consistent with the prevailing market rate for capital and it would be difficult for us to refuse such a request.

95. Frontier and the Electricity Networks Association (**ENA**) suggested following the WACC workshop that using a prevailing approach for the risk-free rate would result in violations of the NPV=0 principle, despite the ability of suppliers to use the interest rate swap market. This is because investment can take place at any time during the regulatory period, but the prevailing rate is set at the start of the period.[47] As a result suppliers would be unlikely to 'fully' hedge their exposure to movements in the risk-free rate because the timing of investments would be unknown during the determination window.

96. We agree that firms may not be able to 'fully' hedge their exposure to the risk-free rate especially for investments during the period with unknown timing. However, a complete hedging approach is unlikely to be efficient practice in any case, as there may be significant costs associated with 'fully' eliminating interest rate risk.

97. Our view is the interest rate associated with the majority of a firm's issued debt can be hedged using the swap market and we provide a reasonable allowance for the cost of that hedging. We also consider that firms would not be able to fully hedge their exposure to the risk-free rate for new investments under a trailing average; this would especially be true for large investments.

98. As part of its submission, Frontier provided analysis that suggested the trailing average actually resulted in lower NPV=0 violations than the prevailing approach when investment during the period is taken into account.[48] However, as noted by Dr Lally, this particular result appears to be based on a single artificially constructed scenario based on 'highly implausible' assumptions that has no empirical basis.[49] As a result we have not put much emphasis on the values provided.

99. The evidence continues to suggest to us that the use of the prevailing rate provides better incentives for efficient investment, and the existence of the interest rate swap market means there is a low likelihood of a significant mismatch between the allowed risk-free rate provided for in the WACC and the interest costs paid by suppliers.

100. Submissions from suppliers also mentioned the movement of the Australian Energy Regulator (**AER**) and some other Australian regulators away from a prevailing (or rate

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47 Frontier Economics (report prepared for Transpower) memo on Dr Lally Appendix "Issues arising from Commerce Commission WACC Workshop" (26 October 2016), para 28; ENA submission "ENA comments on Frontier memo re Dr Lally Appendix" (26 October 2016), p. 1-2.

48 Frontier Economics (report prepared for Transpower) memo on Dr Lally Appendix "Issues arising from Commerce Commission WACC Workshop" (26 October 2016), para 53.

49 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 36-37.

on-the-day) approach towards a trailing average and noted that we would be 'out-of-step' with overseas regulatory practice if we maintained a prevailing approach.[50]

101. Although we are aware of the developments in Australia, the AER has made it clear that there are trade-offs between the two approaches and that they consider the prevailing approach does have advantages in encouraging efficient investment and promoting outcomes consistent with a workably competitive market:[51]

> Rather, we consider the on-the-day approach has advantages, including:
>
> - It is consistent with the prevailing market cost of debt as close as possible to the commencement of the regulatory period. As such, it is commensurate with efficient financing costs at the commencement of the regulatory period and can promote efficient investment decisions. It is also internally consistent with how we estimate other components of the allowed rate of return and other building block components.
>
> - It leads to an estimate that is likely to more closely imitate the outcomes of a competitive market near the start of the regulatory period than a trailing average approach.

102. We have therefore considered each option taking into account the advantages and disadvantages of the different approaches. We also note the AER (and other regulators) work under different frameworks to the regulatory regime here in New Zealand. Given the trade-offs between the two different approaches, different frameworks may result in a tendency towards different choices.[52]

103. A number of submissions from suppliers appeared to imply that our main objective in selecting a WACC should focus less on promoting outcomes consistent with workably competitive markets, but instead we should focus on minimising commercial risk to regulated businesses.[53] We agree that we should minimise risks to regulated businesses, however only to the extent that it helps deliver long-term benefits to consumers and consistency with the Part 4 purpose, not as a goal in itself.

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50 Transpower "IM review: Submission on suite of draft decision papers" (4 August 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), para 82-82; Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 31-32

51 AER "Final decision Jemena distribution determination 2016 to 2020: Attachment 3 – Rate of return" (May 2016), p. 3-292. Available at: https://www.aer.gov.au/system/files/AER%20-%20Final%20decision%20Jemena%20distribution%20determination%20-%20Attachment%203%20-%20Rate%20of%20return%20-%20May%202016.pdf

52 For example, a framework which has a stronger focus on the financeability of regulated suppliers compared to the investment incentives may result in stronger reasons to apply a trailing average.

53 See for example: Aurora "Submission – Input Methodologies Review: Frontier Economics' report on Lally ROTD Appendix" (31 October 2016), p. 2.

104. Another reason for maintaining the prevailing approach for the risk-free rate is because it is a relatively straightforward mechanism for estimating the cost of debt. It does not require obtaining and collecting data over a longer period of time, annual updates or any issues when considering the best way to transition to a new cost of debt approach.

105. We also consider that frequent changes in the cost of debt methodology can potentially result in stakeholders arguing for the methodology that is most beneficial for them at that any particular point in time (ie, based on historical interest rates or future expectations of interest rates). We realise that this issue is perhaps less relevant under the current process, given the fact the next price reset for most regulated suppliers is a number of years away. However, we consider it provides a rationale for maintaining a consistent cost of debt methodology.

106. We also disagree with the view from Frontier that:[54]

> In our view, the Commission has overstated the one-off administrative switching costs associated with moving from the ROTD approach and the TACD approach. In Australia, these costs have been minimal.

107. The ongoing appeals process on the transition to a trailing average for energy networks in Australia suggests that the overall costs of switching to a trailing average have not been minimal.[55] In particular, the potential for significant one-off gains to suppliers or consumers from the transition process means that the methodology of any transition is likely to be contentious.

108. As outlined above, we consider that there are strong reasons for maintaining a prevailing risk-free rate. However, we note that there are also legitimate reasons why a trailing average might be favoured. In making the decision we have considered all of the views put forward by the many suppliers who were in favour of moving to a trailing average approach for the risk-free rate.

109. We consider the strongest reasons *against* using prevailing approach for the risk-free rate are:

    109.1 costs associated with using the interest swap market; and

    109.2 the potential pricing impact on consumers from a significant change in the risk-free rate.

110. We describe below why we do not consider these issues to be sufficiently material to change from our existing prevailing approach to estimate the risk-free rate.

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[54] Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 27-28.

[55] Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1.

Issues related to the use of the interest rate swap market

111. We consider that suppliers do have the ability to use the interest rate swap market to hedge themselves against the risk-free rate. Hedging by suppliers can also benefit consumers to the extent that hedging activities result in more stable debt-financing for suppliers, which can result in a stronger incentive for suppliers to make investments. We have therefore provided an allowance for some costs associated with undertaking interest rate swap transactions.

112. More specific concerns have been raised by suppliers on the market impact of the hedging activity of regulated suppliers and their ability to use the interest swap market to fully hedge the risk-free rate.

    112.1 Transpower and Powerco have suggested that a concentration of hedging activities around the determination window can affect the price of interest rate swaps.[56]

    112.2 Frontier and ENA have outlined the difficulties in hedging the risk-free rate for investments that take place over the period.[57]

    112.3 Transpower considers that firms are not compensated for the use of forward starting swaps for the length of time between the WACC determination window and the start of the price-quality path.[58]

113. Although we understand the concerns raised by suppliers we consider that there is limited evidence to suggest that these swap market issues result in a significant additional cost to suppliers over and above the allowance for swap costs.[59] In addition, we do not think that consumers should necessarily pay for suppliers to completely hedge 'all' of their debt such that it is completely matched to the five-year risk-free rate fixed for the regulatory period.

114. We are setting a benchmark cost of debt which does not attempt to fully replicate a particular financing or risk management strategy. We consider any costs associated with hedging have to be considered by a supplier against the benefits to consumers.

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[56] 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; Transpower submission "Input methodologies review – Post WACC workshop documents" (5 October 2016), p. 1-2, Attachment A; Powerco "Explanation of bond to swap spread data analysis" (28 September 2016). It also considered that any impact on swap markets will feed through to government bond rates used to estimate the risk-free rate for the WACC. As a result it considered that ultimately the cost passes through to consumers.

[57] Frontier Economics (report prepared for Transpower) memo on Dr Lally Appendix "Issues arising from Commerce Commission WACC Workshop" (26 October 2016), para 28; ENA submission "ENA comments on Frontier memo re Dr Lally Appendix" (26 October 2016), p. 1-2.

[58] Transpower "IM review: Submission on suite of draft decision papers" (4 August 2016), p. 8.

[59] We provide an allowance for swap transaction costs as part of the 'debt issuance costs' element of the cost of debt.

115. Of the issues raised above, we consider that there has been limited evidence provided by submissions that suggest the swap market is significantly affected by the actions of the regulated suppliers concentrating hedging in a small determination window.

116. There has been some provision of data on the swap market from Powerco and Transpower.[60] However, we agree with Contact Energy (**Contact**) and Dr Lally that:[61]

116.1 there was limited price movement in the swap market during the previous determination window for electricity businesses that could not be explained by normal interest rate movements;[62] and

116.2 suppliers have provided limited evidence (other than assertions) that swap rates would have been affected by the hedging activities of regulated suppliers.

117. Despite the lack of evidence in this area, we consider there is a potential concern (of unknown materiality). As a result we have mitigated the risk of supplier hedging activity affecting the swap market by extending the determination window used to estimate the risk-free rate from one month to three months.

118. In response to our draft decision on this point, submissions agree that this concern has been alleviated to some degree by the extension of the determination window to three months.[63]

119. We also agree that firms may not be able to exactly hedge the risk-free rate for investments that take place during the regulatory period.[64] However, this will only be a relatively small element of their total capital requirements and the majority can be hedged at the start of the period.[65] We also note the ability of firms to use forward

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60 Transpower submission "Input methodologies review – Post WACC workshop documents" (5 October 2016), Attachment A; Powerco "Bond to swap spread data analysis" (28 September 2016).

61 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016) p. 38-39; Contact Energy "Input methodology review: Cost of capital – Response to recent Transpower submission (dated 5 October 2016)" (26 October 2016), p. 1-2.

62 We note that Transpower has suggested that this was due to declining interest rate trends at the time (falling milk prices and US Federal Reserve decisions), the absence of which would have resulted in significant increases to the swap rate. Transpower submission "Input methodologies review – Post WACC workshop documents" (5 October 2016), Attachment A.

63 ENA "Input methodologies review – Topic paper 4 cost of capital issues – Submission to the Commerce Commission" (4 August 2016), para 10; Orion "Submission on input methodologies review – draft decisions" (4 August 2016), para 36; Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016) p. 24; Transpower "IM review: Cross submission on suite of draft decision papers" (25 August 2016), p. 3.

64 ENA submission "ENA comments on Frontier memo re Dr Lally Appendix" (26 October 2016), p. 1-2.

65 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 36.

starting swaps, delay or bring forward investment to help manage this risk – in cases in which it is beneficial for them to do so.[66, 67]

120. Similarly it *may* be beneficial for firms to use forward starting swaps to manage the risk associated with the fact that there is a delay between the determination window and the start of the price path.[68]

121. However, it is unlikely to be efficient to fully use swaps to precisely hedge all debt associated with planned investment because the 'cost' of any mismatch risk may be less than the cost of the swap transaction.

122. After considering all of these issues we do not consider that there are significant problems with the swap market operation that would alter our decision or result in material costs to suppliers that should be passed through to consumers. Although there are some risks to suppliers associated with using the swap market, we do not consider these risks are large, they provide an incentive on suppliers to undertake an efficient financing strategy and minimise costs, and we do not consider that these incremental hedging activities will necessarily provide long-term benefits to consumers.

123. We note that Transpower's alternative drafting proposal to the TCUP suggests that we should align the determination window for the IPP risk-free rate with the WACC determination for information disclosure. This would have the effect of increasing the period between the determination window and the start of the price-quality path by two months. This suggestion could imply that the length of the time period between the window and start of the path is less significant than other issues. [69]

124. We have maintained our draft decision to extend the determination window to three months, which we considered would help mitigate some of the issues raised by stakeholders on swap market operation. As noted above, a number of submissions agreed with this point.

125. When considering the issues with the swap market, we have also considered how the costs of undertaking swap market transactions compare against the additional costs of using a 10-year trailing average using bonds with a 10-year original term.

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66 The degree to which a supplier will manage interest rate exposure will depend on the trade-off between the cost of the risk mitigation measure against the residual risk exposure. For example it seems unlikely that 'all' interest rate pricing risk would be completely hedged as the costs are likely to be prohibitive.

67 Transpower submission "Input methodologies review – Post WACC workshop documents" (5 October 2016), Attachment A; Contact Energy "Input methodology review: Cost of capital – Response to recent Transpower submission (dated 5 October 2016)" (26 October 2016), p. 2-3.

68 Consumers may are likely to be willing to pay for hedging costs to the extent that it provides benefit to them (eg, provides a greater incentive for suppliers to invest because they are able to obtain more stable financing costs).

69 Transpower "Input methodologies review: Technical consultation on updates to draft determinations" (3 November 2016), p. 6.

This form of trailing average methodology has been suggested by a number of suppliers.[70]

126. Debt issued with a longer original tenor tends to be higher priced and so the costs of swap transactions need to be considered in that context.[71] Contact have suggested that the average premium of 10 year government bonds yields over five year government bonds yields has been 27 bps, and an average of 44 bps when the yield curve was positive.[72]

127. In considering this trade-off we also note that moving to a trailing average would not necessarily negate the need for swap market transactions completely.[73] Businesses are still likely to use swaps to some extent (and incur associated costs) because they are unlikely to exactly replicate the perfectly staggered approach to debt issuance assumed under a trailing average and it will be efficient to continue to use swaps to some extent.[74]

128. This is because a supplier's actual debt issuances are likely to be influenced by prevailing debt market conditions and the trade-offs between different types of debt instruments. Although there will be some costs involved under either approach, we agree that swap market costs are likely to be lower under a trailing average, particular for a trailing average which estimates the cost of debt on the basis of a similar original tenor to that issued by suppliers. However, these costs are unlikely to be zero and so need to be considered when weighing up the trade-off between the higher costs of debt with a longer original tenor and the costs of swaps.

129. PwC (on behalf of 17 EDBs) suggested a trailing average for the full cost of debt, but with a five-year average rather than the 10-year average favoured by other submitters.[75] It suggested that the cost of debt should be estimated with respect to bonds which reflect the average tenor of distributor-issued bonds, or failing that the TCSD allowance should be retained together with a cost of debt estimate that reflects a five-year tenor.

130. This suggestion is likely to result in lower interest rates compared to a 10-year trailing average using a cost of debt estimate for a bond with a 10-year original

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70 See, for example: Wellington Electricity "Input methodologies review: Response to draft decisions" (4 August 2016), p. 6.

71 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 26.

72 Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 3.

73 Some submissions have suggested that suppliers would not need to undertake swap transactions under a trailing average approach. For example: CEG "Key reforms to rate of return under the IMs" (report prepared for ENA, February 2016), para 208.

74 As Transpower have outlined, suppliers would still use swaps to some extent under a trailing average approach. Commerce Commission "WACC workshop transcript" (September 2016), p. 124.

75 PwC "Submission to the Commerce Commission on input methodologies review: Draft decisions papers – Made on behalf of 17 Electricity Distribution Businesses" (4 August 2016), para 55.

term.[76] However, we still do not consider it is an appropriate solution because, as with a 10-year trailing average, the five-year average reduces the incentives for dynamically efficient investment as described in paragraphs 85 to 86.

131. We also note that if a five-year trailing average is used then this implies that there would be:

131.1 no reduction in swap costs (assuming firms issue debt with an average original tenor longer than five years and hedge to the regulatory period); or

131.2 an increase in refinancing risk (because firms would issue debt with an original tenor of five years rather than the longer original tenors that submissions from suppliers suggest are more appropriate).

132. Another point made in submissions is that smaller firms should be provided with a higher allowance for debt costs.[77] We disagree. We do not consider that in workably competitive markets customers would be willing to pay higher prices to firms based on the size of the firm.[78] Therefore we make no allowance for any type of cost in excess of the benchmark cost of debt.

133. We do not consider that any of the evidence provided in submissions suggests that there are significant issues or costs associated with swap participation that outweigh the incentive benefits of the prevailing approach.

Period to period volatility

134. One of the arguments made in submissions against using the prevailing rate is that it can result in volatility from one period to another for consumers.[79]

135. Although price stability is a key consideration for consumers we are not convinced that the greater potential for volatility in the cost of debt by using a prevailing risk-free rate rather than a trailing average is sufficiently large to justify a change in approach.

136. A price increase of 10% p.a. has previously been the benchmark which we have considered to be a sufficiently large shock to consumers that can merit regulatory

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[76] Assuming an upward sloping yield curve

[77] ENA "Input methodologies review – Topic paper 4 cost of capital issues – Submission to the Commerce Commission" (4 August 2016), para 56.

[78] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para 6.4.29.

[79] ENA "Input methodologies review – Topic paper 4 cost of capital issues – Submission to the Commerce Commission" (4 August 2016), para 84; Transpower "IM review: Submission on suite of draft decision papers" (4 August 2016), p. 6.

action to mitigate that shock.[80] However, because WACC is treated as constant for the length of the regulatory period, any price increase will be a one-off increase at the start of the period. Our ability to set alternative rates of change under the DPPs and Transpower's ability to smooth prices over the period means that the impact of any individual annual price increase can be mitigated.

137. Given the existence of these regulatory mechanisms and the limited impact of the cost of debt on total allowable revenues, we do not consider that the impact on consumers is sufficiently large for us to move away from our draft decision to apply a prevailing approach to estimating the cost of debt.

Historical averaging of the debt premium

138. An issue recognised in the draft decision was the potential mismatch between the debt premium incurred by firms who issue debt on a regular rolling basis, and the corresponding compensation allowed for in our estimate of 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.[81]

139. The 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.

140. We previously considered that the potential for material mismatches (in regard to the debt premium) was minimal due to the relatively stability of the debt premium (particularly compared to the risk-free rate). However, we have now been persuaded that there is a benefit in moving to a historical averaging approach.

141. Figure 2 shows the debt premium as determined by us since 2012. The average over the last five years has been approximately 1.8%.

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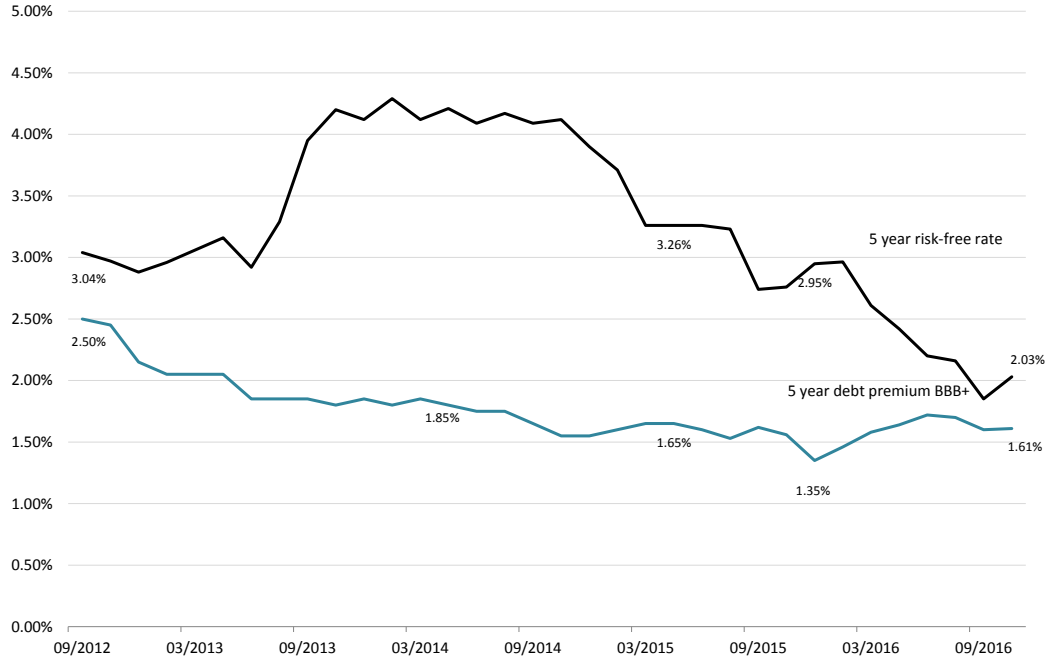
[80] For example, we have previously limited price increases for certain EDBs when setting the 2012 DPP. See: Commerce Commission "Resetting the 2010-15 default price-quality paths for 16 Electricity Distributors" (30 November 2012), para 6.3-6.10.

[81] Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 103-109; 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.

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



142. Potential mismatches of the debt premium are a known disadvantage of the prevailing approach. However, for the draft decision we considered that the magnitude of any mismatch would be small and could be managed by suppliers, being mitigated due to the following factors.

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

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

142.3 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.[82]

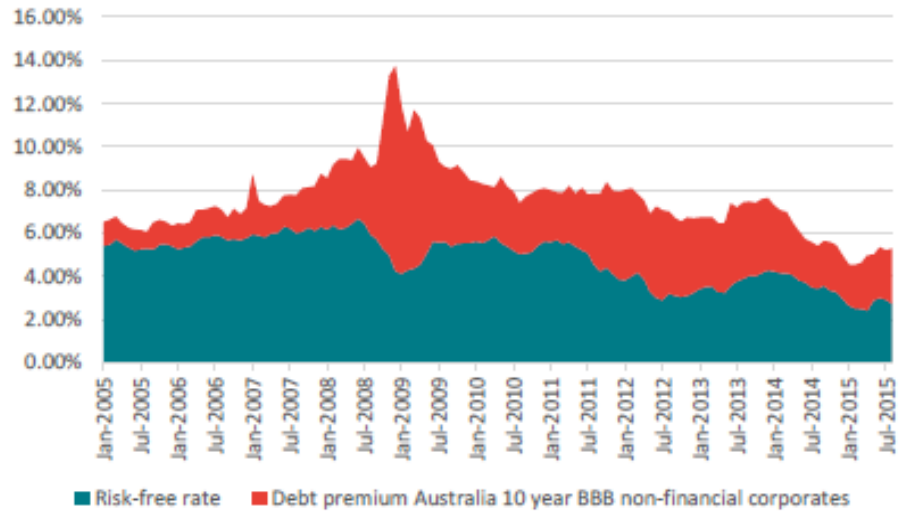
143. In response to the draft decision, Frontier (on behalf of Transpower) submitted that we were overstating the stability of debt premium and pointed out that certain market conditions can cause large changes in the debt premium.[83] Figure 3 is

82 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.

83 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), Section 2.2.1.

provided by Frontier and shows how the debt premium for BBB non-financial corporate bonds spiked in Australia in the aftermath of the financial crisis in 2008-2009.[84]

Figure 3: Debt premium on BBB non-financial corporate bonds – Australia



Source: Data from Reserve Bank of Australia; Frontier analysis

144. On the whole, we continue to consider that suppliers should be able to manage the normal volatility associated with the debt premium. However we recognise that if the determination window happened to coincide with a period of abnormal market conditions, then suppliers could be over or undercompensated in comparison to their incurred debt. We consider that significant one-off movements in the debt premium of this type could have a sufficiently large effect on revenues to suppliers and prices paid to consumers that estimating an 'average' debt premium over a longer period of time is a more appropriate solution.

[84] Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), Figure 2.

145. A period of high debt premiums could have a negative impact on both:

145.1 suppliers – who are unable to hedge against significant movements in the debt premium and so can be exposed to mismatches between their incurred debt premium (eg, under a staggered debt issuance strategy) and the allowance provided in the WACC;[85] and

145.2 consumers – who may have to pay for a high debt premium for the length of the regulatory period if a spike in the debt premium coincides with the fixed determination window.

146. Given the above, we have changed our approach to estimating the debt premium compared to the draft decision. We now consider that, on balance it is more appropriate to provide a historical average of the debt premium, rather than retaining the prevailing approach proposed in the draft decision.

147. Our decision is therefore to apply a five-year historical average when estimating the debt premium, rather than a prevailing approach which uses a three month determination window consistent with the risk-free rate.

148. This revised approach should allay some of the concerns that suppliers have outlined in submissions that basing the debt premium on a single determination window once every five years exposes them to the risk that it is lower than the average debt premium incurred from debt issuance over a longer historical period.

149. We consider that this change results in a small negative impact on investment incentives for suppliers, but we consider that the impact of this would be limited, given the generally small movements of the debt premium in normal market conditions. On balance we have decided it is more appropriate to protect consumers against one-off significant changes in the debt premium by applying a historical average.

Transition to a historical average for the debt premium

150. We have decided to apply a historical average without any transition period. We previously outlined how any move to a different cost of debt approach may require a transition to ensure that there is not the potential for windfall gains for suppliers/consumers.[86] However, we do not consider it is required in this instance.

151. The potential for windfalls arises because immediate changes to the cost of debt approach uses known historical rates. This means we have some knowledge of

[85] Although we consider that suppliers have some ability to manage their debt issuance practices at times when there is high debt premium (eg, defer capex, issue short-term debt), the lack of a hedging market (eg, like the swap market for the risk-free rate) means that this is more difficult.

[86] Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 135.6.

historical rates at the time of making the decision which can directly affect supplier compensation.

152. As outlined by Contact,[87] the current circumstances in which interest rates have been falling over the last few years means any immediate change to an approach that uses a historical rates is likely to benefit suppliers over consumers. Despite the move to a historical average for the debt premium, we do not consider any transition period is required because of the following.

152.1 The debt premium has been relatively stable over the last five years, with only small movements in relevant corporate bond rates. This means the impact of any gain is limited.

152.2 Suppliers are unable to hedge the debt premium, so the actual debt premium incurred by suppliers is likely to more closely resemble a historical average than the existing approach.

153. The decision not to undertake a transition has been taken based on consideration of the current circumstances. Whether a transition would apply to any future change in the cost of debt methodology, will depend on the circumstances at that particular time.

154. The historical averaging approach can be implemented in a number of slightly different ways. Our initial option provided in the Technical Consultation and Update Paper (**TCUP**) aligned the annual debt premium used in the averaging process with the three month determination window used for the annual WACC determination for ID.[88]

155. A number of submissions to the TCUP suggested that we should extend this averaging period to 12 months to ensure that it covers a full year's worth of data.[89] We agree that this is likely to result in a more representative estimate of the average debt premium over five years and means that abnormal market yields outside the three month window will not be missed. Using 12 months data rather than three does not result in any significant extra effort and so we have updated the methodology for future estimates to be consistent with this suggestion.

156. However, we do not plan to re-estimate debt premium values for previous years. Therefore, in the short term the historical averaging approach will apply values that

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87 Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 4.

88 Commerce Commission "Input methodologies review – Technical consultation update paper" (13 October 2016), Attachment A, para 93.

89 ENA "Input methodologies review: Technical consultation update paper – Submission to the Commerce Commission" (3 November 2016), para 34; Vector "Vector submission on the draft amended input methodologies determinations" (3 November 2016), p. 7; Orion submission on IM review technical consultation and on the ENA letter regarding live-line work "Submission on input methodologies review technical consultation" (3 November 2016), para 12.

use debt premiums estimated previously by the Commission, using the approach detailed in the previous IMs. More detail on how the historical averaging approach will apply in practice is provided in Attachment G.

No annual updating

157. We maintain our view from the draft decision that the introduction of annual updating of the debt premium (or risk-free rate) would not provide sufficiently material long-term benefits to consumers to justify the administrative costs of an annual update process.[90]

Approach for Information Disclosure

158. The advantages of using a trailing average approach for the full cost of debt appear slightly stronger in the context of ID than for a price-quality path. A more stable estimate of WACC may provide benefits to interested parties when assessing supplier profitability using disclosed information.[91]

159. However, we do not consider this benefit would be substantial in assessing profitability.

    159.1 We agree with Dr Lally's view that any assessment of ex-post profitability should take place over number of years.[92] 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.

    159.2 To date our assessments of supplier profitability have been generally undertaken using the WACC set at the start of a price-quality path or price setting event (for airports).[93] Under these circumstances, the methodology used to determine the annual WACC for ID is not as significant.

160. We have therefore decided to apply the same WACC methodology for ID as for price-quality paths. Any benefits in applying a trailing average for the full cost of debt

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90 Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 158.

91 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.

92 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.

93 For example, our analysis of EDB profitability: Commerce Commission "Profitability of Electricity Distributors Following First Adjustments to Revenue Limits" (8 June 2016).

for ID do not warrant the additional complexity that arises if the approach for ID diverges from the approach for price-quality regulation.[94]

Other issues raised with our debt premium methodology

161. Our decision is to estimate the debt premium using a five-year historical average. This approach requires us to continue to estimate the debt premium each year.

162. The methodology used to estimate this 'annual' debt premium is broadly consistent with our previous prevailing approach.[95] However, we have decided to make some modifications in the relation to use of government-owned bonds and the NSS curve. Our decision is to:

    162.1 Change the draft decision to remove the restriction on using government-owned bonds in estimating the debt premium. We have reverted to the previous IM approach, in which a restriction was placed on the use of government-owned bonds. However the restriction only applies to bonds issued by entities which are 100% government-owned.[96]

    162.2 Have regard to the NSS curve approach when determining the debt premium. The previous approach relies on a certain degree on judgement when estimating the debt premium, which we consider would be reduced by having regard to the NSS curve approach.

Government-owned bonds

163. The draft decision removed the restriction of the use of government-owned bonds in the debt premium estimate. However, our final decision is that the restriction will only apply to 100% government-owned entities.

164. We agree with Competition Economists Group (**CEG**)'s submission that the yields on 100% government-owned bonds are likely to behave differently and have lower debt premiums than other equivalent bonds. We have therefore made a distinction

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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), p. 10-11.

95 The main change is that we will now use a full 12 months of data to estimate the debt premium, rather than the one month of data used in the pre-review IMs.

96 The restriction to entities which are 100% government owned is a practical step, which means we are able put greater weight on the bonds from majority government-owned gentailers (ie, Meridian, Mighty River Power, Genesis) which we consider show pricing behaviour more consistent with bonds issues by privately-owned companies. However we will still restrict the use of bonds from entities fully owned by the government (eg, Transpower) whose bond prices are less likely to be consistent with privately owned companies, given the existence of an implicit guarantee from the government in the event of financial distress.

between the bonds that are issued by partially privatised firms and those that are issued by firms that are 100% government-owned.[97]

NSS curve

165. The draft decision outlined how we investigated the use of the NSS curve to remove the element of judgement in the debt premium estimate.

166. PwC and Contact supported the use of the NSS curve,[98] while Transpower thought that although it could be useful in principle, more testing would be required before it was appropriate to use in the debt premium methodology in the IMs.[99]

167. We note the concern from Transpower, however we consider that the current approach is sufficiently robust to be considered when estimating the debt premium. The existing approach already requires judgement in determining the notional five-year BBB+ estimate from bond data that does not exactly match those criteria.

168. As part of the judgement based approach, we consider an estimate from a NSS curve would help us in determining the appropriate value for the debt premium. Further detail on our approach to estimating the NSS curve is provided in Attachment D.

169. Contact also suggested that we should only have regard to bonds which are rated BBB, BBB+ and A-.[100] We do not consider that this is appropriate due to the limited dataset available for New Zealand corporate bonds. Having regard to the widest set of available bonds (taking into account their relevance to the reference credit rating) is likely to result in the most robust estimate of the debt premium.

Issues raised with our approach to the term credit spread differential

170. The cost of capital IM includes a TCSD allowance to compensate suppliers for the additional debt premium that can be incurred from issuing debt with a longer original term than the five-year regulatory period.[101]

171. Following a review of the appropriateness of the TCSD and how it had been implemented, we proposed in our draft decision to simplify our approach to the TCSD.[102]

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97 CEG (report prepared for ENA) submission on IM review draft decisions papers "Review of the proposed TCSD calculations" (4 August 2016), para 19-20.

98 PwC "Submission to the Commerce Commission on input methodologies review: Draft decisions papers – Made on behalf of 17 Electricity Distribution Businesses" (4 August 2016), para 284; Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 32.

99 Transpower "IM review: Submission on suite of draft decision papers" (4 August 2016), p. 12.

100 Contact Energy [PUBLIC] "Input methodology review: Cost of capital – Response to technical consultation update paper dated 13 October 2016" (3 November 2016), p. 4.

101 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.

172. We have maintained our draft decision to simplify the TCSD by using a fixed linear relationship to determine the additional debt premium associated with debt issued with an original tenor of more than five years for electricity and gas companies.

173. Following further analysis of bond data, we have revised our estimate of the 'spread premium'[103] used in the TCSD formula from 5.6 bps p.a. to 7.5 bps p.a. as described below.

174. Submissions from suppliers were generally supportive of the simplification of the TCSD and that it was still required in the absence of an assumed original debt tenor longer than five years.[104]

175. Alternatively, Contact submitted that there should be no requirement for a TCSD at all, as it considered that debt funding can be managed effectively with bonds with five-year original terms and that there is no offsetting reduction for shorter-term debt.[105]

176. After reviewing submissions, we continue to consider that issuing bonds with an original tenor of longer than five years is likely to be an efficient method to fund assets with long economic lifetimes. There is no method by which the higher debt premiums of these longer-term bonds (ie, compared to the debt premium on a five-year bond) can be hedged to the regulatory period in the same way as for the risk-free rate. Therefore, we maintain our view that the TCSD is a valid element of the efficient cost of debt.[106]

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102 Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 184.

103 The spread premium coefficient is the additional allowance (per year of additional tenor) provided for qualifying debt with a longer original tenor than five years.

104 ENA "Input methodologies review – Topic paper 4 cost of capital issues – Submission to the Commerce Commission" (4 August 2016), para 21-23; PwC "Submission to the Commerce Commission on input methodologies review: Draft decisions papers – Made on behalf of 17 Electricity Distribution Businesses" (4 August 2016), para 277; Vector "Submission to Commerce Commission on the IM review draft decision and IM report" (4 August 2016), para 124.

105 Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 33. Contact also made some suggestions on refining the TCSD as part of their submission to the TCUP. We have reviewed these submissions, but have not made any further changes to the methodology given the late stage of the submission and our consideration that the changes will not have a material impact. See: Contact Energy [PUBLIC] "Input methodology review: Cost of capital – Response to technical consultation update paper dated 13 October 2016" (3 November 2016), p. 5.

106 See also: Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H5.19-H5.22.

Approach for energy businesses

177. On the whole, suppliers supported the move to simplify the TCSD. However, a submission from CEG (on behalf of the ENA) proposed some improvements to the methodology.[107]

> In the event the Commission continues with the on-the-day approach, ENA members agree with the Commission's proposal to retain the TCSD but consider that improvements can be made to the new methodology that the Commission proposes for estimating the TCSD. CEG addresses the improvements in its advisory report to the ENA.

178. The suggestions from CEG to improve the estimate of the TCSD were to:

178.1 estimate a spread premium coefficient for individual months of data rather than pooling data over the whole historical period;

178.2 exclude bonds that were issued by 100% government-owned companies; and

178.3 exclude bonds that have a Bloomberg Valuation Service (**BVAL**) score below 6.[108]

179. We agree with CEG that there are some concerns with pooling across the whole sample. To account for these concerns, we have broken the full dataset into semi-annual periods to estimate spread premiums before calculating the average spread premium over the sample.

180. In analysing CEG's data, we found that some monthly spread premium estimates included large outliers and missing values due to insufficient bond observations in those months. For this reason, we focus on a semi-annual period rather than a monthly period as proposed by CEG.

181. We also agree with CEG that the yields on bonds issued by companies with 100% government ownership appear to behave differently to other bonds and have lower debt premiums than equivalent bonds. Therefore we have excluded bonds from the sample that were issued by 100% government-owned companies.[109, 110]

182. We do not consider that we need to include the BVAL restriction in our analysis. The BVALs are a third-party assessment on the reliability of bond data, which is

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107 CEG (report prepared for ENA) submission on IM review draft decisions papers "Review of the proposed TCSD calculations" (4 August 2016); CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Review of the proposed TCSD calculations – Update report" (25 August 2016).

108 BVAL scores are used as a proxy for reliability of data. Bloomberg assigns each bond yield a BVAL score from 1 to 10, with 10 being the most reliable pricing information and 1 being the least reliable.

109 In practice this has resulted in the removal of bonds issued by CIAL, three gentailers (Meridian, Genesis, Mighty River Power) prior to their part-privatisation

110 We have also made an equivalent change in our methodology to estimate the debt premium. See para 163.

potentially less objective than alternative criteria. In CEG's analysis, it was also found that applying the BVAL score restriction mostly excluded bonds which, at the time, were issued by a 100% government-owned entity. Given that we have excluded this type of bonds anyway, we do not consider that including the BVAL criteria would significantly improve the dataset.

183. Following these changes we estimated the spread premium looking at different data samples, using both CEG's estimates of the five-year debt premium estimate using a NSS curve, and the Commission's historical debt premium estimates. We also analysed samples using only BBB+ bonds and also samples with BBB, BBB+ and A- bonds with rating dummy variables.

184. In determining the spread premium coefficient, we have focussed on the period from 2013-2016 due to some anomalously high estimates of the five-year debt premium, from prior to 2013 – this leads to negative spread premium estimates on bonds with longer original terms than five years.[111]

185. Consideration of both CEG and our spread premium estimates imply a range of between 5 to 10 basis points. After giving most weighting to spread premium estimates using our own methodology and using the most recent time periods, we have decided the most appropriate estimate of the spread premium coefficient is 7.5 basis points.[112]

186. Further details on the analysis undertaken to estimate the spread premium is provided in Attachment E.

187. Transpower submitted that a TCSD was not appropriate for Transpower under its IPP. It considers the approach adopted for Chorus in the final UBA/UCLL decision should also be applied to Transpower.[113]

188. We consider that our decision not to include a TCSD for Chorus, which was under a different regulatory regime (in which we were estimating the WACC for a hypothetical efficient operator), does not assist us in assessing whether we should remove the TCSD for Transpower.

189. Moreover, as we have explained above, we consider that retaining a TCSD for both Transpower and the other energy businesses is appropriate in order to cover the additional costs of debt issued with a longer original tenor than five years (where that type of debt is shown to be actually issued by a supplier). We also note that, although we did not include a TCSD for Chorus, our decision to estimate a debt

111 This is because the 'spread premium' is calculated from the difference between the longer tenor debt premium (eg, 7 years) and the five-year debt premium.

112 This estimate is consistent with the suggestion by Transpower for a value of 8 bps. Transpower "Input methodologies review: Technical consultation on updates to draft determinations" (3 November 2016), p. 2.

113 Transpower "IM review: Submission on suite of draft decision papers" (4 August 2016), p. 11.

premium for a term longer than five years was consistent with many of the principles and the effect of a TCSD.[114]

Approach for airports

190. Our draft decision supported removing the TCSD for airports. This outcome was reached because, under the revised approach, the value of the TCSD allowance would always be zero for airports. This arises as the positive spread premium for airports is more than offset by the lower per annum debt issuance costs from issuing longer-term debt.

191. Our draft decision for the removal of the TCSD for airports has been supported by NZ Airports. NZ Airports stated that: [115]

> NZ Airports is comfortable with the proposal to remove the term credit spread differential from the information disclosure requirements, because it is an example of where the benefits do not outweigh the cost of calculation.

192. Given the support from airports for removing the TCSD, we maintain the draft decision to remove the TCSD for airports.

Compensation for debt issuance costs

193. The previous IMs recognise that fees and costs associated with prudent debt issuance and refinancing costs are legitimate expenses that should be compensated for and provided a 35 bps (0.35%) p.a. allowance as part of the cost of debt.

194. We consider that our previous allowance was generous and reduced it to 20 bps (0.20%) p.a. for the draft decision, including an allowance for swap transactions.[116]

195. Uncertainty over the level of debt issuance costs meant that we proposed, as part of the TCUP, to remove the debt issuance cost allowance from the WACC. Instead we proposed that debt issuance costs should be recovered through regulatory cash-flows.[117]

196. We have now returned to the position put forward in the draft decision and will provide an allowance for debt issuance costs of 20 bps (0.20%) p.a. in the cost of debt.

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114 Commerce Commission "Cost of capital for the UCLL and UBA pricing reviews " (15 December 2015), para 89.

115 NZ Airports "Submission on Commerce Commission's input methodologies review draft decision" (4 August 2016), para 172.

116 Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 219.

117 Commerce Commission "Input methodologies review – Technical consultation update paper" (13 October 2016), Attachment A.

TCUP proposal to include debt issuance costs in cash-flow allowances

197. A number of submissions did not agree with the proposal to include debt issuance costs in regulatory cash-flows put forward in the TCUP, because they considered:

197.1 it was inconsistent with our notional cost of capital approach and could be prone to manipulation;[118]

197.2 it was a significant change at a late state of the IM review process;[119]

197.3 there was an absence of detail in how debt issuance costs will be accommodated in opex allowances;[120] and

197.4 it would add complexity and uncertainty that is not warranted.[121]

198. Transpower did support the suggested change to debt issuance costs. However, it noted that additional changes needed to be made to the definition of operating costs and approach to opex forecasts in the IPP to make it workable.[122]

199. Following these submissions and a review of the evidence, we have decided to keep an allowance for debt issuance costs in the cost of debt. Although we consider that there remain legitimate advantages of the alternative 'cash-flow' approach, we agree with submissions that note the change has the potential to cause additional complexities that do not necessarily warrant the benefits of a more explicit allowance for debt issuance in regulatory cash-flows.

200. We have maintained the draft decision recommendation that the value of debt issuance costs should be 20 bps (0.20%) p.a.

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118 ENA "Input methodologies review: Technical consultation update paper – Submission to the Commerce Commission" (3 November 2016), para 27-28; Powerco "Submission on input methodologies review: Technical consultation update paper" (3 November 2016), para 6.

119 ENA "Input methodologies review: Technical consultation update paper – Submission to the Commerce Commission" (3 November 2016), para 27; Powerco "Submission on input methodologies review: Technical consultation update paper" (3 November 2016), para 6; Orion submission on IM review technical consultation and on the ENA letter regarding live-line work "Submission on input methodologies review technical consultation" (3 November 2016), para 6.

120 Vector "Vector submission on the draft amended input methodologies determinations" (3 November 2016), para 9.

121 Contact Energy [PUBLIC] "Input methodology review: Cost of capital – Response to technical consultation update paper dated 13 October 2016" (3 November 2016), p. 1; Wellington Electricity "Input methodologies review: Response to technical consultation update paper" (3 November 2016), p. 4.

122 Transpower "Input methodologies review: Technical consultation on updates to draft determinations" (3 November 2016), p. 3.

Summary of 20 bps (0.20%) p.a. estimate for debt issuance costs

201. The 20 bps (0.20%) p.a. estimate is our best view of the 'average cost' of a benchmark supplier that issues NZ domestic vanilla bonds on a regular basis consistent with our 'simple approach' to estimating the cost of debt.[123]

202. Although we recognise that there may be additional costs associated with brokerage and/or a new issue premium ('at certain times'), we do not consider the 'average cost' to the benchmark debt issuance is commensurate with the level of costs suggested by suppliers in submissions. Costs and premiums appear to be relatively variable and dependent on market conditions.

203. Given the variability in costs, we have deliberately not been precise in estimating debt issuance, but the 20 bps we have used broadly represents:

    203.1 Debt issuance costs – 9-10 bps p.a;

    203.2 Swap transaction costs – 3-4 bps p.a; and

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

204. Further details on how we reached the conclusion on debt issuance costs are provided in the following sections.

205. As described by Transpower, we consider there is some uncertainty over the treatment of costs related to debt issuance with regard to operating costs.[124] We have therefore adapted the definition of operating cost in the IM determinations to make it clear that the costs of debt issuance and the execution of swap costs should not be included as an operating cost.[125]

Inclusion of swap costs in the debt issuance cost allowance

206. The previous IMs provided 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 was only provided for debt with an original tenor longer than five years for qualifying suppliers.

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123 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), H5.29-H5.32. The 'simple' approach to estimating the cost of debt excludes any costs associated with debt issued in foreign markets or bank debt.

124 Transpower "Input methodologies review: Technical consultation on updates to draft determinations" (3 November 2016), p. 3.

125 For example, *Electricity Distribution Services Input Methodologies Amendments Determination 2016* [2016] NZCC 24.

207. We have changed this restriction and now provide a general allowance for the cost of executing swaps as part of the debt issuance cost allowance. 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 tenor that is greater than five years: for example, if a firm issues debt on a rolling five-year basis.

208. This is consistent with a suggestion from Contact:[126]

> 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.

Determining the debt issuance cost allowance

209. 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.

210. We consider that the 35 bps (0.35%) debt issuance cost allowance in the previous IMs was generous because it was higher than our finding from the 2010 confidential debt survey that the average debt issuance cost is 0.22% p.a. and was greater than similar costs allowed by overseas regulators.[127] The High Court judgment on the appeals to the original IMs agreed with the assessment that the debt issuance costs were generous to suppliers.[128]

211. 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 30 vanilla NZ domestic bonds that are equivalent to the type of bond from which we estimate the debt premium.[129] The average issuance cost provided in the debt survey of these bonds was 9 bps p.a. when averaged over the original tenor of the bond, and 10 bps p.a. when the costs are assumed to be averaged over a five-year term.[130]

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

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

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

129 This is a slight increase from the draft decision because we identified some additional bonds from the survey that fitted the criteria of a vanilla domestic bond and also we included an allowance for credit rating costs, where it had been provided in a disaggregated form.

130 We note that the estimate of debt issuance costs for Transpower did not come directly from the results of the survey but based on separate data that included disaggregated costs from two of their most recent bond issues.

212. 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 executing an interest rate swap is about 2 bps p.a.

Stakeholder submissions on debt issuance costs

213. Submissions on debt issuance costs varied across different stakeholders and covered a number of different types of costs or premiums that could be associated with individual debt issuances. The main issues on which stakeholders submitted were:

213.1 analysis of debt survey results and the costs associated with foreign issued bonds;

213.2 use of brokerage and wholesale/retail bonds;

213.3 credit rating costs and cost of headroom/standby facilities; and

213.4 new issue premium.

Analysis of debt survey and the simple approach

214. As outlined in our draft decision, we use a 'simple' approach to estimating the cost of debt which focusses on one type of debt.[131] 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'.[132] 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.[133]

215. Given this approach, we do not take into account other types of debt (eg, bank debt, non-vanilla corporate bonds, foreign issued bonds) that may have different issuance costs. It is particularly important that our assumptions for debt issuance are consistent with our approach to estimating the debt premium because in practice there will be trade-offs between the interest rate paid and debt issuance costs for different forms of debt.

131 Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 228-230.

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

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

216. Despite this, we received a number of submissions suggesting that we should include the costs associated with a firm issuing foreign or non-vanilla debt.[134] Despite the existence of other types of debt, and the fact that we consider it can be efficient for firms to use different types of debt instrument, we continue to consider that the simple approach is more appropriate for the purposes of estimating a benchmark debt issuance allowance. This is supported by Contact, which noted:[135]

> We strongly recommend the Commission adheres to its approach of the hypothetical efficient, prudent issuer that funds via issuance of 5 year retail listed bonds in the New Zealand market. It is not appropriate (or fair to consumers) for a cost of funds to be determined for the entire regulated sector based on a selected portion of the funding portfolio from a selected portion of the regulated entities.

217. CEG (on behalf of the ENA) undertook some additional analysis of the debt survey results provided to them by the ENA members in which it obtained an average debt issuance costs of 25-31 bps p.a. compared to our own estimate of 9-10 bps p.a.[136]

218. After analysing the ENA's analysis we are confident that the reason for the higher costs is because it included non-vanilla domestic bonds from the survey data (eg, credit-wrapped, foreign bonds). We have also adjusted some costs provided in the survey following further data requests.

Use of brokerage and retail bonds

219. Brokerage is a cost associated with a retail bond that can significantly increase the price of debt issuance. Powerco suggested that this is legitimate cost that should be included in debt issuance:[137]

> The Commission has referenced evidence from Contact regarding debt issuance costs. In our view the costs presented are misleading. Contact submitted data that showed the cost of issuance before and after the cost of brokerage (the fee paid to brokers to distribute a bond to retail investors). The Commission has surprisingly chosen to publish the non-brokerage cost which is estimated by Contact to be 5-7bps per annum. In contrast Contact's estimate of the cost of issuance including the cost of brokerage is 15-25bps per annum. We consider that brokerage costs are legitimate cost incurred in raising debt, and should be compensated for.

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134 CEG (report prepared for ENA) submission on IM review draft decisions papers "Industry debt statistics" (4 August 2016), para 32; 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.

135 Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 6.

136 CEG (report prepared for ENA) submission on IM review draft decisions papers "Industry debt statistics" (4 August 2016), Table 6-1.

137 Powerco "Submission on input methodologies review – Draft decisions" (4 August 2016), para 296.4.

220. Although we consider that brokerage costs may be required to issue bonds efficiently, we note that:

220.1 issuing wholesale bonds does not require the payment of brokerage, but these type of bonds are included in our dataset for estimating the debt premium;[138]

220.2 issuing retail bonds does not necessarily require the payment of brokerage, dependent on market conditions;[139] and

220.3 the regulatory reforms made with the enactment of the Financial Markets Conducts Act (**FMCA**) appear to have reduced the costs for repeat issues of retail bonds, which may lower the need for brokerage payments.[140]

221. From the available evidence, it appears that in certain circumstances it *may* make sense to pay brokerage, but at other times, particularly for repeat-issue retail bonds, it may not be required. As a result, it is one of that factors that have led us to allowing a debt issuance cost higher than the direct results of the confidential survey.

Credit rating costs and use the use of headroom or cost of carry facilities

222. In the draft decision, we suggested that credit rating costs were not necessarily an efficient component of the cost of debt, as they were not necessarily required to issue a NZ vanilla corporate bond by a NZ entity.[141]

223. In response Houston Kemp (on behalf of Powerco) submitted that:[142]

> In our opinion, it is not reasonable to determine the cost of debt for a supplier under an assumption that it maintains a credit rating of BBB+, but then to set aside efficient costs that it must incur to achieve this. This is not consistent with the efficient debt issuance costs principle, and it is not consistent with maintaining incentives for suppliers to invest – which in turn does not promote the long-term benefit of consumers as set out section 52A of the Commerce Act.

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138 Wholesale bonds tend to have slightly higher interest rates due to the lower number of available purchasers. However, we note that the majority of corporate bonds used to estimate the debt premium recently are retail bonds. We note that Contact suggested that we should restrict the use of wholesale bonds, however we consider the potential for a larger dataset to use when estimating the debt premium justifies their inclusion. See: Contact Energy [PUBLIC] "Input methodology review: Cost of capital – Response to technical consultation update paper dated 13 October 2016" (3 November 2016), p. 3.

139 Contact have provided an example of when it issued a retail bond without paying brokerage. Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 6.

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

141 Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 232.

142 Houston Kemp (report prepared for Powerco) submission on IM review draft decisions papers "Issues raised by the Commerce Commission's draft decision on cost of capital" (4 August 2016), p. 6.

224. We now agree that, given our approach to estimating the debt premium, it is consistent to assume that a supplier is likely to maintain a credit rating and there may be costs associated with maintaining a credit rating (for example credit rating agency fees). However, we disagree with the magnitude of costs suggested by Houston Kemp (on behalf of Powerco). We maintain our view that standby facilities are a prudent aspect of debt management, but that these facilities are generally associated with the use of shorter-term debt.

225. We do not consider that under our simple approach, that there would be a requirement for both standby facilities and cost of carry, for regular refinancing of domestic bonds. We also consider that the costs suggested could be lowered by an efficient supplier, as described by Contact:[143]

> • Houston Kemp calculations state that cost of carry is 2.4-2.6% p.a. being the difference between the cost of debt and the three month bank bill / Treasury bill rate. Contact considers this to be overly conservative – for example, Contact could currently (and this has been the case for many years now) invest for three months at a spread of 0.5-0.6% above the current bank bill rate, implying that the cost of carry is overstated by 0.5-0.6%.
>
> • However, discussion of the spread between borrowing and investing is somewhat academic - given short term bank facility costs of about 0.3% p.a. (based on Contact's experience, adjusted for tenor and rating), then the most efficient approach is to cover 3 month refinancing risk with an additional short term bank facility instead of incurring a much higher cost of carry.
>
> • In any case, there are also other additional ways of avoiding or minimising prefunding costs: forward start (available in USPP), early repayment (available in USPP up to 3 months), using funds to repay other outstanding short term bank debt or commercial paper or bridging the maturity with additional short term bank facilities (which means the borrower actually enjoys a benefit from the temporarily lower cost of funds).

226. Although we consider that the costs provided by Houston Kemp are overstated, we consider that there may be a small cost associated with maintaining liquidity under our simple approach. As a result, it is another factor that has led us to allowing a debt issuance cost higher than the direct results of the confidential survey.

New issue premium

227. The 'new issue premium' is a potential discount that firms may have to apply to enable them to offer new debt into the bond markets.[144] Houston Kemp (on behalf of Powerco) submitted a report estimating the new issue premium in NZ to be 10-12 bps p.a:[145]

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143 Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 8.

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

145 Houston Kemp (report prepared for Powerco) submission on IM review draft decisions papers "Issues raised by the Commerce Commission's draft decision on cost of capital" (4 August 2016), p. 8-12, 25-34.

Contrary to the Commission's findings, we consider that there is evidence of an existing new issue premium for New Zealand denominated bonds. To this end, HoustonKemp analysed the available evidence and reached the following conclusion:

> The results of our analysis suggest that a new issue premium… exists for these bonds, and that its value is approximately 10 to 12 basis points, based on information sourced from a large number of bonds issued in New Zealand dollars, issued by companies domiciled in New Zealand.

228. Contact on the other hand submitted that its comparison of the margin on a new retail bond against its existing bonds, found no evidence of a discernible new issue premium.[146]

229. Although we agree that there is a potential for new issue premiums to be observed in New Zealand, we consider the level suggested by Powerco is overstated. We note the submission from Contact outlining some of the reasons why Houston Kemp's analysis may overstate this premium, including the fact that the sample set used was dominated by banks; used data from 2009/10 (post GFC); and includes a wide variety of debt instruments.[147]

230. We also note the emphasis in Houston Kemp's analysis on an eight week period after issuance, which appears relatively arbitrary and the use of swap rates rather than interest rates consistent with the relevant corporate bond rating.[148] This could mean other factors that affect the difference between swap rates and corporate bond rates would influence the results obtained by Houston Kemp.

231. In considering the evidence on the new issue premium, we also undertook further analysis of Houston Kemp's data and observed that:

    231.1 using different time periods tends to reduce the implied new issue premium towards 8 bps p.a. rather than 10-12 bps p.a.; and

    231.2 removing bank bonds, and bonds issued around the GFC from the Powerco data set further results in new issue premium of 5-8 bps p.a.

232. The evidence from Contact and Houston Kemp differs in their estimate of whether is a new issue premium in the NZ corporate bond market and the magnitude of any premium. It is difficult for us to determine what the correct level should be and so it is another factor that has led us to adopting a debt issuance cost higher than the direct results of the confidential survey.

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146 Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 29-30.

147 Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 6-7.

148 As noted by Houston Kemp, the use of swap rates is because of a lack of data availability in New Zealand. Houston Kemp (report prepared for Powerco) submission on IM review draft decisions papers "Issues raised by the Commerce Commission's draft decision on cost of capital" (4 August 2016) p. 9.

233. We also note that our use of bid rates rather than mid rates provides a small benefit to the supplier which would provide some compensation for any costs incurred as a result of the new issue premium.[149]

Swap costs

234. 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

235. Based on this definition, we estimated a swap cost of 4 bps when estimating the cost of capital for the unbundled copper local loop (**UCLL**)/unbundled bitstream access (**UBA**) pricing review.[150] However, this estimate was based on the observed data value from a single day.[151] 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.

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

237. 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).[152]

238. 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.[153] However, it suggested that these costs should be reviewed. Houston Kemp suggested we should estimate the costs of swaps from the confidential debt survey.[154]

239. Some submissions argued we should provide compensation for the costs of cross-currency swaps. However, as noted previously this is inconsistent with our simple

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149 This issue is considered in para 248-249.

150 Commerce Commission "Cost of capital for the UCLL and UBA pricing reviews " (15 December 2015), para 112-122.

151 This date was 1 August 2014.

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

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

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

approach to estimating the cost of debt because cross-currency swaps are not required by suppliers when issuing domestic vanilla bonds.[155]

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

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.[156]

242. We disagree with this conclusion because 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 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.[157]

244. Information received from the 2016 debt survey and submissions suggest that these costs are more likely to be in the region of 9-10 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 (9-10 bps) and costs of any required swaps (3-4 bps). As noted above, given the uncertainty and variability of the various costs, we consider it is prudent to include an additional allowance to cover other issues related to debt issuance.[158]

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155 See para 216.

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

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

158 See para 203.3.

Other matters related to estimating the cost of debt

247. This section summarises other matters concerning the cost of debt. This includes:

247.1 our decision to maintain the used of bid rates rather and mid rates when estimating yields on government and corporate bonds; and

247.2 our decision to maintain a credit rating of BBB+ for EDBs, GPBs and Transpower; and A- for airports.

Use of bid rates

248. Contact considered that our current approach of taking the 'bid' rates rather than 'mid' rates for bond yields provided an advantage for suppliers. [159]

249. Although we have some sympathy with Contact's suggestion that we should use 'mid' rates rather than 'bid' rates, we have decided not to change the approach. The reason is that bid rates provide a small benefit to suppliers which are likely to offset (although to an unknown extent) the potential impact from 'new issue premiums' that has been described in paragraphs 227-233. We took this effect into account as part of our decision to provide an allowance of 20 bps (0.20%) for debt issuance costs.[160]

Credit rating

250. We have maintained Standard and Poors (**S&P**) (or equivalent from another recognised agency) long-term credit ratings of:

250.1 BBB+ for EDBs, GPBs and Transpower; and

250.2 A- for airports.

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

252. 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.

253. 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-.

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[159] Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 31.

[160] See para 194.

254. 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.[161] 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.

255. 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".[162]

256. 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.

257. It is difficult to accurately estimate the debt premium specific to a BBB+ (or A-) rated regulated supplier, 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 debt premium.[163]

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161 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.

162 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.

163 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.

Chapter 4: Cost of equity

Purpose of this chapter

258. The purpose of this chapter is to explain our decisions regarding the cost of equity, including any changes we have made, resulting from our review of:

    258.1 the main issues raised in relation to the cost of equity; and

    258.2 each of the parameters that make up the cost of equity.

Structure of this chapter

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

    259.1 how we estimated the asset beta for EDBs and Transpower, GPBs, and airports using a similar approach to 2010 (with updated data); and

    259.2 whether we have made any adjustments to asset beta for regulatory differences or differences in exposure to systematic risk.

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

261. 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, Transpower and GPBs, and then as it relates to airports.

Asset beta

262. This section describes our approach to reviewing the asset beta estimates for EDBs, Transpower, GPBs, and airports.

263. As a result of this review, we have made the following changes to the asset beta values we originally specified in December 2010.

    263.1 We have increased the asset beta for EDBs and Transpower from 0.34 to 0.35, after updating the comparator sample analysis.

    263.2 We have reduced the asset beta for GPBs from 0.44 to 0.40. This represents a 0.05 upwards adjustment to the (revised) electricity asset beta, compared with 0.10 in the 2010 IMs.

    263.3 We have maintained an asset beta of 0.60 for specified airport services.

264. When combined with the updated notional leverage values we have determined, the revised asset betas lead to the following changes to the equity beta values specified in the cost of capital IMs.[164]

264.1 The equity beta for EDBs and Transpower has decreased from 0.61 to 0.60.

264.2 The equity beta for GPBs has decreased from 0.79 to 0.69.

264.3 The equity beta for specified airport services has increased from 0.72 to 0.74.

Summary of changes since the draft IM review decision

265. Between the draft IM review decision (published on 16 June 2016) and this final IM review decision, we have:

265.1 increased the asset beta for EDBs/Transpower from 0.34 to 0.35. This reflects updated comparator sample analysis, including correction of spreadsheet errors for weekly estimates, and minor refinements to the comparator sample in response to submissions;

265.2 increased the asset beta for GPBs from 0.34 to 0.40, which is based on a 0.05 uplift from the revised asset beta for EDBs and Transpower of 0.35. The draft decision proposed no gas asset beta uplift. However, based on additional evidence provided in submissions, we now consider an uplift is appropriate (but not as high as the 0.10 used previously); and

265.3 increased the asset beta for airports from 0.58 to 0.60, after correcting the spreadsheet errors affecting weekly asset beta estimates.

Approach to estimating asset beta

We have followed a six-step process when determining asset beta estimates

266. Our approach to estimating asset (and equity) betas is largely unchanged from 2010.[165] We have followed the same six-step process for estimating beta, which is summarised below.[166]

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

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

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164 As discussed in paragraphs 546 to 572, we have determined notional leverage of 42% for EDBs, Transpower and GPBs, and 19% for airports. This is compared with notional leverage of 44% and 17% in the 2010 IMs.

165 As noted in paragraphs 269 and 288-291 below, we have used weekly and four-weekly asset beta estimates (averaged across each possible reference day) in this review. This is opposed to using weekly and monthly estimates based on data for the last trading day of the week or month, as we did in 2010.

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

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

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

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

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

267. Although we have updated the comparator samples used and time periods considered, we have estimated very similar (unadjusted) asset betas to our 2010 decision.

268. In reaching our 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. However, we have also had regard to earlier periods (1996-2001 and 2001-2006) and daily estimates.

269. We calculated weekly and four-weekly betas, averaged across each trading day, in response to submissions on the cost of capital update paper. 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.

Beta measures exposure to systematic risk

270. Equity beta is a measure of exposure to systematic risk.[167] 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:

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

270.2 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).

271. 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)*.

[167] Systematic risk is assessed from the perspective of an investor with a fully diversified portfolio.

272. Beta is not directly observable so we estimate it empirically. 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.

273. 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 owns the only publicly listed EDB/GPB in New Zealand. Therefore, we use a sample of international comparator firms when estimating beta.

We have determined an asset beta of 0.35 for EDBs and Transpower

274. The discussion below explains why we consider an asset beta of 0.35 should be used for EDBs and Transpower, based on the updated analysis we have undertaken.

Identifying a sample of relevant comparator firms

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

276. We have continued using the large energy comparator sample (of approximately 70 companies) as our primary approach to determining asset beta. This is as opposed to making significant refinements to the comparator sample (as suggested by TDB, for Contact) or using separate electricity and gas samples (as suggested by Oxera, for First Gas).

277. We consider that using the large energy sample has several benefits over the alternative approaches suggested in submissions. For example, this approach:

277.1 limits the need to make subjective judgement calls regarding whether each of the 74 companies from the draft comparator sample should be included, as required under TDB's approach to refining the comparator sample. In particular, we consider there is a lack of clarity regarding the thresholds, evidence, and judgement calls TDB made when excluding companies from the sample;[168]

277.2 ensures that integrated electricity and gas businesses remain in the sample. In contrast, using separate electricity and gas sub-samples (as suggested by First Gas and Oxera) would exclude potentially useful data. For example, the only New Zealand based company in the sample (Vector) would be excluded; and

277.3 maintains consistency and stability with the approach used when setting the original IMs in 2010. Therefore, this reduces the risk of large swings between

[168] Our concerns with TDB's approach to refining the comparator sample are explained in more detail in paragraphs 309 to 320 below.

reviews based on a change in approach, rather than a change in asset beta data.

278. We have considered alternative approaches to sample composition as a cross-check, as discussed in more detail in paragraphs 309 to 320 below. We consider these alternative approaches lead to broadly similar outcomes to our large energy sample. Therefore, given the limitations of the alternative approaches, we consider there is limited justification for adopting them over our large energy sample.

279. We have included New Zealand, Australian, UK, and US-based electricity and gas utilities when determining our energy 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.

280. 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.

281. 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.[169]

282. 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.[170]

283. This approach resulted in a sample of 74 firms for the draft decision. Further details regarding these 74 companies, including changes from the 2010 comparator sample, company descriptions, and asset beta results, are included in Attachment A.

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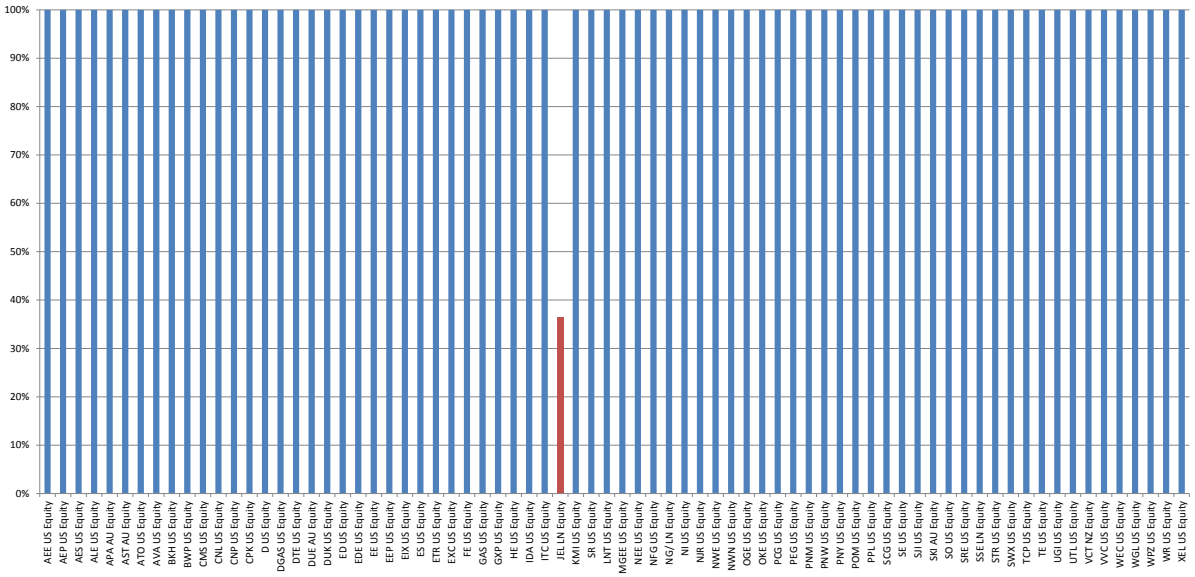
169 In the 2010 IMs decision we used the following classifications: 'Electric – Distribution', 'Electric – Integrated', 'Electric – Transmission', Gas - Distribution' and 'Pipelines'. Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December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

170 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.

284. We have excluded two companies from the energy sample since the draft, in response to submissions we received. Therefore, our final energy sample comprises 72 companies.

284.1 Jersey Electricity (JEL LN Equity) has been removed due to illiquidity.[171] In particular, Oxera submitted that Jersey Electricity should be excluded from the sample due to a low percentage of days traded.[172] We agree. As shown in Figure 4 below, Jersey Electricity was only traded on approximately 36% of the possible trading days for the 2011 to 2016 period.[173]

Figure 4: Percentage of days traded for companies in energy sample (2011-2016)



284.2 National Fuel Gas Company (NFG US Equity) has been excluded because CEG provided specific evidence that this company "has exploration and production activities that, in terms of their contribution to EBITDA over the period 2012 to 2015, exceeded gas pipeline activities (gathering, transmission

171 Our draft decision also discussed an earlier submission from Frontier Economics regarding Amihud's liquidity metric. Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 277 to 280.

172 Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 14.

173 Submissions from TDB and CEG also supported excluding Jersey Electricity. CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), p. 28; and TDB Advisory Limited (report prepared for Contact Energy) "Submission to the Commerce Commission on the input methodologies review draft decisions: Comparative company analysis" (4 August 2016), p. 18.

and storage)".[174] TDB also identified NFG as an outlier, and excluded this company from the sample in step 1 of its refinement process.[175]

285. Oxera also suggested several other liquidity and gearing filters, which we have not applied for the reasons below.[176]

285.1 **Average free float percentage.** We consider this has limited value as a liquidity measure. As Contact noted: "A company's shares could still be liquid if it has a high absolute number and value of shares traded, even if the percentage of its shares in free float is small".[177] For example, the current value of Vector's publicly traded shares is approximately $800m, even though it has a relatively low average free float percentage (approximately 25%).

285.2 **Average bid-ask spread percentage.** Although we consider an average bid-ask spread filter may have some merit, we have not used this filter. We note that using the bid-ask spread filter to exclude Delta Natural Gas (as suggested by Oxera) would have no impact on the average asset beta and leverage results for our comparator sample. Further, if we were to apply this filter, we would need to determine a subjective threshold to apply across both the energy and airports samples.[178]

285.3 **Average gearing.** Oxera proposed removing AES Corp from the sample based on its high average gearing level.[179] We have not applied Oxera's gearing filter because, in our view, none of the companies in the sample are sufficiently highly geared to be problematic when undertaking our beta analysis.[180] Specifically, for the 2011-2016 period, the highest leverage in the sample is 67% (for both AES and DUE).[181] This is close to the notional gearing range

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174 CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), p. 27.

175 TDB Advisory Limited (report prepared for Contact Energy) "Submission to the Commerce Commission on the input methodologies review draft decisions: Comparative company analysis" (4 August 2016), p. 21-23 and 44.

176 Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 13-17.

177 Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 11.

178 For consistency, we consider the approach to liquidity filters should be applied across the energy and airports samples. The issue regarding the appropriate threshold for the average bid-ask spread percentage becomes more apparent when considering the airports comparator sample. See footnote 358 below for further discussion.

179 Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 17.

180 To the extent that relatively high leverage affects the equity beta for a firm, this is adjusted for in the de-levering process.

181 In response to Oxera's submission, Contact Energy noted that AES could be removed from the sample because it has a sub-investment grade credit rating (Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 11). However, we note that removing AES Corp would have no impact on the average asset beta for the comparator sample. Further, requiring companies to have an

within which Ofgem uses a zero debt beta (55%-65%, as referred to in Oxera's submission).

Estimating the equity beta for each firm in the sample

286. We have used a similar process to 2010 when estimating the historical equity beta for each of the 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 288 to 291.

287. 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:[182]

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

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

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

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

288. 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.

289. 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".[183] Frontier also indicated that the risk is magnified when moving from weekly to monthly estimates.

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investment grade credit rating could potentially exclude a significant number of companies from the energy and airports samples, given that many of them are not rated.

182 We used daily equity beta estimate reported by Bloomberg. We calculated the weekly and four-weekly beta estimates ourselves, as noted in para 286.

183 Frontier Economics "Cost of equity issues related to input methodologies review" (report prepared for Transpower, February 2016), p. 41 and 45.

290. Similarly, CEG noted the risk of estimation error from using a single monthly asset beta estimate:[184]

> …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.

291. 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:

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

    291.2 weekly equity betas, by estimating equity betas for each of the five possible trading days/reference days and then averaging the results.[185]

292. Since the draft decision, we have corrected several errors in our asset beta spreadsheet. Overall, correcting these errors has increased the weekly asset beta estimates.

    292.1 CEG noted that there was an error in the calculation of the weekly stock returns, resulting from incorrect cell referencing.[186] We agree, and have corrected this error.

    292.2 We also identified two further spreadsheet errors as part of our review process, which we have now corrected.[187]

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

185 Submissions generally supported this approach. For example, see: Vector "Submission to Commerce Commission on the IM review draft decision and IM report" (4 August 2016), para 126; ENA "Input methodologies review – Topic paper 4 cost of capital issues – Submission to the Commerce Commission" (4 August 2016), para 76; PwC "Submission to the Commerce Commission on input methodologies review: Draft decisions papers" (4 August 2016). para 246; Transpower "IM review: Submission on suite of draft decision papers" (4 August 2016), section 4.5; and Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 46.

186 CEG noted that the percentage return was calculated as $(P_2 – P_1)/P_3$, where P_3 is the stock's ending price 21 days prior to the date of P_1. However, the percentage return should have been calculated as $(P_2 – P_1)/P_2$. CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), p. 29.

187 The formula for calculating "x bar" in the "Weekly Be calculations" sheet incorrectly referred to the "4-weekly Be calculations" sheet (for example, cells H12:H2031). Further, cell B88 of the "4-weekly Be calculations" sheet incorrectly contained a hardcoded number (1), resulting in an incorrect reference date.

293. We have also excluded two companies, Kinder Morgan (KMI) and Williams Partners (WPZ), for the 2006-2011 period. CEG's cross submission noted that it appears "…the Commission has inadvertently included gearing data for KMI and WPZ despite Bloomberg not having stock data for these firms in 2006-11".[188] Given that less than one year of share price data was available for each of these firms, we have excluded these companies when calculating the average asset beta (and leverage) for 2006-2011.

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

294. 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.

295. 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.

295.1 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 firm's asset beta, β_e is the firm's equity beta, β_d is the firm's debt beta, and L is the firm's leverage.

295.2 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:[189]

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

296. 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 1. Further details regarding the results for the comparator sample are included in Attachment A.

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188 CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), p. 31.

189 As discussed in paragraphs 546 to 572, we have used the average asset beta and average leverage of our comparator sample to address the leverage anomaly. In this case, the equation in paragraph 295.1 is used to calculate the asset beta for each individual firm in the sample (by de-levering each equity beta), and the average asset beta (and leverage) of each individual firm is calculated. The equation in paragraph 295.2 is then used to re-lever the average asset beta into an equity beta, using the average leverage of the comparator sample. Assuming that all firms have the same debt beta, this approach produces the same result regardless of whether a zero or non-zero debt beta is assumed.

Table 1: Summary of energy asset beta comparator sample results

	1996-2001	2001-2006	2006-2011	2011-2016
Daily asset beta	0.16	0.31	0.40	0.39
Weekly asset beta	0.11	0.29	0.38	0.36
Four-weekly asset beta	0.07	0.31	0.35	0.30
Average leverage	41%	46%	43%	41%
# of companies with data available	61	67	70	72

297. 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 greater weight should be given to:

297.1 the two most recent five-year periods (ie 2006-2011 and 2011-2016), for the reasons explained in paragraphs 299 to 302; and

297.2 weekly and four-weekly asset beta estimates (rather than daily estimates), for the reasons given in paragraphs 303 to 307.

298. The average asset beta across weekly and four-weekly estimates, for the 2006-2011 and 2011-2016 periods is 0.35.

299. Aswath Damodaran, 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:[190]

> 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.

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

301. 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 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.[191]

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190 Estimating Risk Parameters, Aswath Damodaran. Available at: (http://people.stern.nyu.edu/adamodar/pdfiles/papers/beta.pdf).

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

302. 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.[192]

303. We have given equal weight to four-weekly and weekly asset beta estimates. Although we have had regard to daily asset beta estimates, we have not given them significant weight when estimating our average asset beta. This is consistent with the approach we took in the draft decision.

304. Several submissions on the draft decision supported giving daily asset beta estimates the same weight as weekly and four-weekly estimates.[193] For example, Oxera (for First Gas) submitted that:[194]

    304.1 while daily betas could produce imprecise estimates in the presence of illiquid stocks, they provide a useful estimate of the asset beta due to an increase in the number of observations in the beta regression;

    304.2 it is consistent with good regulatory practice to use daily beta estimates, as well as other frequencies;

    304.3 the standard errors of daily asset betas are in line with standard errors from weekly and four-weekly regressions; and

    304.4 there is no academic consensus for selecting the optimal frequency of observations for beta estimation.

305. Contact agreed that there does not seem to be any accepted best practice regarding use of daily, weekly or four-weekly asset betas, but noted that it is important that the Commission is transparent and consistent in its approach. Contact suggested that "…a pragmatic and transparent way forward is for the Commission to consistently take an average of the weekly and four-weekly betas to minimise estimation error due to the choice of reference period".[195]

306. We note that there is a trade-off between problems of weekly/monthly betas and daily betas.

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

193 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 47-52; and PwC "Submission to the Commerce Commission on input methodologies review: Draft decisions papers" (4 August 2016), para 247.

194 Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 20-21.

195 Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 12.

306.1 Daily asset beta estimates can be distorted by low liquidity stocks. To calculate an accurate asset beta estimate, it is important to measure *contemporaneous* changes in the individual firm's share price and the relevant market index. The shorter the estimation interval used (eg daily), the more difficult it is to capture a contemporaneous link, particularly where shares are infrequently traded.[196]

306.2 Weekly and monthly asset beta estimates, on the other hand, lead to fewer observations being available when undertaking the regression analysis. This can affect the statistical significance of the results.

307. In reaching our decision to give primary weight to weekly and four-weekly betas, we note that:

307.1 our approach of averaging weekly and four-weekly betas across all possible reference days significantly reduces any concerns about a lack of observations for weekly and monthly estimates;

307.2 although international evidence based on regulatory precedent and academic papers is ambiguous, a recent study of evidence from Australia, Germany and the UK concluded that "…longer frequency betas have superior characteristics for regulatory purposes in these countries" and that its findings "…imply that low frequency beta estimates should always be preferred to high frequency beta estimates";[197] and

307.3 our past approach in the 2010 IMs decision was to focus on weekly and monthly asset beta estimates.

308. We note that giving more weight to daily asset betas would increase our estimate, but having regard to earlier periods would decrease our estimate. This suggests that giving weight to additional time periods and frequencies would not provide strong support for departing from our estimate of 0.35. Therefore, we consider the average weekly/four-weekly estimate for 2006-2011 and 2011-2016 of 0.35 is appropriate.

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196 Frontier Economics submitted that any of the main statistical problems that may arise with daily betas (including serial correlation, heteroscedasticity, and non-synchronous trading) can be addressed relatively easily as part of the estimation process. However, Frontier Economics did not indicate whether these problems are present in our asset beta data set, or provide any corrected daily beta estimates. Given we are satisfied with the robustness of our approach of averaging weekly and four-weekly estimates, we have not conducted further analysis of daily estimates, as referred to by Frontier. Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 50-51.

197 Alan Gregory, Shan Hua and Rajesh Tharyan "In search of beta" (April 2015).

We have also considered alternative approaches to comparator sample

309. We have also considered several other approaches to determining the comparator sample for energy businesses. In particular, we have considered:

309.1 TDB's three step approach to refining the energy sample;[198]

309.2 splitting the energy comparator sample into separate electricity and gas sub-samples, as suggested by Oxera (for First Gas);[199]

309.3 Oxera's refined sample, after applying all of its suggested liquidity and gearing filters; and

309.4 using Thomson Reuters Business Classifications (**TRBC**) as a cross-check, as suggested in First Gas' cross submission.[200]

310. Figure 5 below presents the asset beta under each of these approaches, averaged across weekly and four-weekly estimates over 2006-2011 and 2011-2016.[201] Results for the sample used in our draft decision, and our refined sample used in this final decision are also included.[202]

198 TDB Advisory Limited (report prepared for Contact Energy) "Submission to the Commerce Commission on the input methodologies review draft decisions: Comparative company analysis" (4 August 2016), p. 36. Step 1: Remove firms with unregulated gathering, processing, liquids and commodity exposures; Step 2: Remove firms with other large unrelated/unregulated business segments. Step 3: Remove firms with significant business segments that are not related to transmission or distribution.

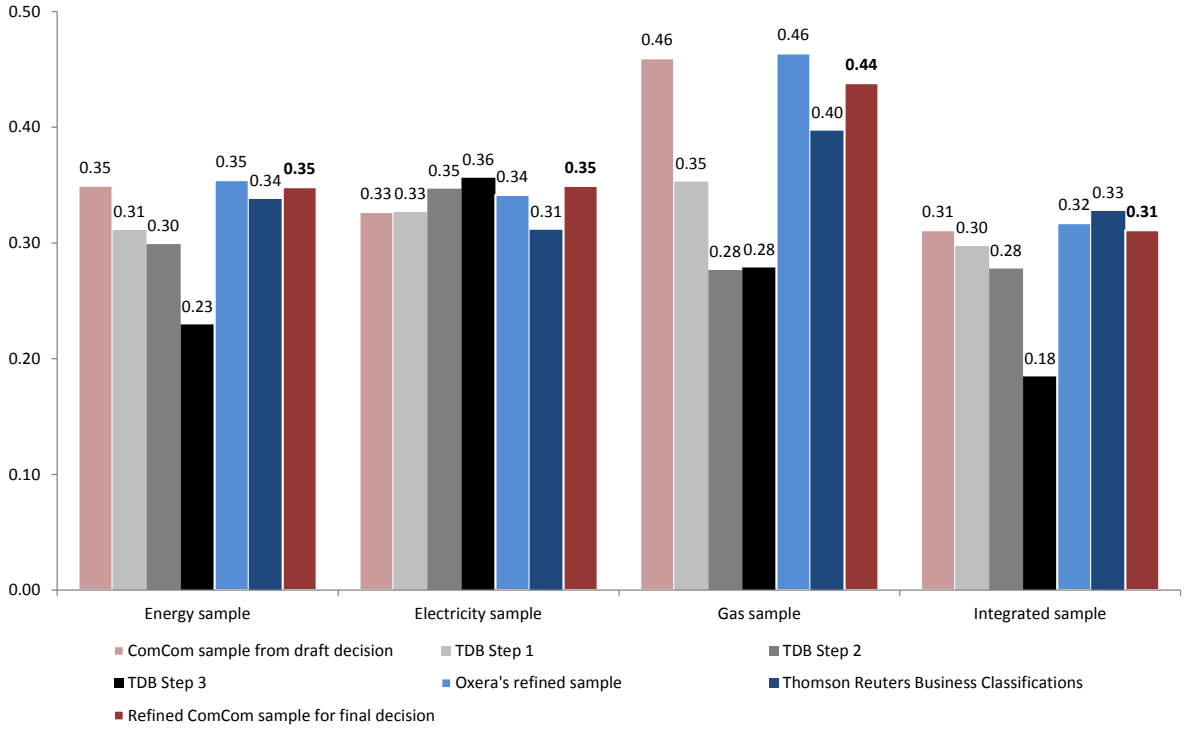
199 Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 2.

200 [PUBLIC] First Gas "Cross submission on input methodologies review draft decisions: Cost of capital issues" (25 August 2016), p. 5-7.

201 The results presented differ slightly from those in the Oxera, First Gas and TDB submissions, due to differences in frequencies and time periods used when averaging the results. The results in Figure 5 are presented on a like-for-like basis, using the asset betas we calculated for each company as set out in Attachment A.

202 The values in Figure 5 were calculated assuming a zero debt beta. As noted by Dr Lally, if debt betas are set at a sensible level, incorporating them has very little effect on the results, so it is not worth the trouble (see paragraph 385.4 below).

Figure 5: Asset beta estimates for alternative approaches to comparator sample



311. Although TDB's refined *energy* sample leads to lower asset betas, we have several concerns with this approach.

311.1 TDB's approach to considering excluding each of the companies in our draft comparator sample is subjective, as acknowledged in TDB's own submission. TDB stated "It is important to note that through this process we have used our best judgment when classifying each firm. There are areas where the firms and the regulations they are subject to is unclear and where firms' business segments are highly complicated".[203]

311.2 TDB appear to have used a binary approach, where companies are excluded from the sample as soon as they have any gas gathering/exploration. We consider a threshold approach may be better (for example, where a company with a significant percentage of relevant activities would remain in the sample). However, insufficient data is available at this time to apply this approach.[204]

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203 TDB Advisory Limited (report prepared for Contact Energy) "Submission to the Commerce Commission on the input methodologies review draft decisions: Comparative company analysis" (4 August 2016), p. 35.

204 Contact Energy suggested that a detailed review of each comparator company should include data on: (1) "Proportion of company's revenues, profitability and assets (where data is available) that are similar to those services being regulated", (2) "Proportion of revenues that are protected by regulation, as opposed to subject to commercial negotiation (fee based) or competitive markets", (3) "Description of type of regulation for regulated assets if possible to obtain (e.g. form of control, protection with demand/other

311.3 Applying all three of TDBs filters would result in a relatively small energy sample of eight companies. Only one of these eight companies is an electricity company (and two are gas companies), based on the classifications used in our draft decision.

311.4 TDB themselves suggested an independent expert review of the sample set (post submissions on the draft decision).[205] Similarly, Contact and Pat Duignan suggested obtaining additional expert advice regarding the companies in the comparator sample.[206] However, we consider that an additional independent expert review would be of limited benefit, given the results of the alternative approaches suggest there is generally little evidence to support moving significantly from our comparator sample average of 0.35.[207]

312. Significantly, the 'electricity' sub-sample results under TDB Steps 1-3 support a relatively tight asset beta range between 0.33 and 0.36. Using TRBC also leads to similar results, with an energy sample average of 0.34 and an electricity sample average of 0.31.

313. Cross submissions from First Gas, CEG (for the ENA) and Frontier Economics (for Transpower) also raised several concerns regarding TDB's approach. For example, Frontier Economics argued that TDB's analysis has three main shortcomings.[208]

313.1 "*Sensitivity to time periods.* TDB's analysis of the distribution of beta estimates and outliers was restricted to just the most recent five-year estimation period considered by the Commission (i.e., 2011-2016), and TDB's conclusions are driven entirely by the time period analysed. As the Commission's own analysis shows, its beta estimates are highly volatile over time. The recommendations that come from a TDB-style analysis change materially from time period to time period. For example, the firms that TDB identifies as 'outliers' in the current time period were not outliers in previous periods. Moreover, firms that were outliers in previous time periods are not outliers in the most recent period. TDB has simply shown that in any time

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changes)", and (4) "Financial data verification – Bloomberg data should be cross checked with company accounts and trading information for verification". Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 34.

205 Commerce Commission "WACC workshop transcript" (September 2016), p. 83.

206 Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 35; and Pat Duignan's submission on the IM review draft decisions papers "Gas pipeline and electricity lines businesses beta analysis" (30 June 2016).

207 We consider that if a further independent review of the sample were to occur, this would benefit from a full consultation process (rather than occurring after submissions on our draft decision have already been received).

208 Frontier Economics (report prepared for Transpower) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Comment on TDB Advisory's analysis of beta comparators" (25 August 2016), p. 1-2.

period some firms will appear to be outliers. But there is nothing systematic about this over time. This simply reinforces the Commission's current approach of considering a large sample of comparators so that this sort of random variation cancels out over time".

313.2 "*Subjective and opaque judgements.* When implementing its three-step filtering process, TDB appears to have applied a series of qualitative judgments about the companies that should be excluded at each step. Whilst these judgments are critical to which companies are included or excluded from the sample, none of the judgments that TDB has made are articulated transparently. As such, there is no way for any other stakeholder to replicate independently the choices made by TDB when constructing the subsamples it proposes, or to verify that TDB's judgments have been applied in a consistent manner to all companies, or to analyse how the TDB approach would have affected beta estimates in previous periods".

313.3 "*Spurious identification of outliers.* TDB seems to have concluded that certain companies are outliers simply on the basis that their estimated betas are 'high' in a particular period. TDB suggests that these companies share common characteristics that lead them to be outliers. However, by way of example, TC Pipelines, which TDB flags as an outlier, does not share these characteristics and thus fails to fit TDB's narrative about the inclusion of companies that would distort the Commission's beta estimate. TDB then argues that 20 companies that are involved in similar activities to the 'outliers' it has identified should be excluded on the basis that they are likely to skew the overall beta estimate. In fact, that contention is not supported by the empirical evidence. The result is that firms are removed from the sample simply because their beta estimates happened to turn out to be relatively high in the most recent period".

314. CEG submitted that TDB's statistical analysis is unreliable given it is based on:[209]

314.1 an invalid comparison across firms/sub-samples without the appropriate adjustment for gearing and debt beta; and

314.2 only the most recent five year period.

[209] CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), p. 1.

315. CEG also stated that:[210]

> TDB has not consistently applied the same logic to its sample selection process and the effect of these internal inconsistencies happens to be that the average asset beta in TDB's final sample is understated. Moreover, had TDB applied the same criteria universally its final sample would be an empty set (i.e., no comparators).

316. First Gas submitted that the approach used to ensure comparability needs to be objective, verifiable, and needs to accord with conceptual logic. However, First Gas stated that TDB's approach fails on all three of these grounds as it involves subjective judgement, is not transparent or verifiable[211], and ignores demonstrated differences between electricity networks and gas pipelines.[212]

317. TDB subsequently clarified its approach to refining the comparator sample at the cost of capital workshop, in response to comments from Frontier Economics and CEG regarding its treatment of outliers. TDB stated:[213]

> …perhaps our report wasn't clear enough but the first part of our report did exactly what Frontier and CEG said, we looked at distribution of the betas, just to get a bit of an understanding of what we were dealing with.
>
> But when it came to the heart of our analysis, the three step process that we used to filter the companies that the Commission could use for its comparator set, we totally disregarded the betas. We went back to first principles and applied a standard commercial approach. We asked the question, what is the risk profile of the companies that we're trying to regulate, i.e. the transporters of gas and energy? And we said, well, what companies have similar characteristics to that in terms of their risk profile?
>
> So, no priors about which companies were in and which companies were out.

318. Although reviewing the composition of the comparator sample (as suggested by TDB) has merit in principle, and is something we will explore again (and in further detail) in subsequent reviews, we consider that the benefits are not sufficient given our concerns regarding the overall robustness (relative to alternative approaches) to change our approach for this review. Our analysis suggests there is no strong evidence to adopt a lower asset beta for EDBs/Transpower at this stage.

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210 CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), p. 1.

211 First Gas noted that TDB's sampling approach suffers from both type one (false positive) and type two (false negative) errors, referring to the examples of Unitil and Atmos Energy Corp respectively.

212 [CONFIDENTIAL] First Gas "Cross submission on input methodologies review draft decisions: Cost of capital issues" (25 August 2016), p. 4-5.

213 Commerce Commission "WACC workshop transcript" (September 2016), p. 18-19.

319. We intend to monitor the asset beta comparator sample over time, and re-look at the composition of the sample in the next IM review. In particular, we intend to focus on:[214]

319.1 the refinements suggested by TDB, with the aim of collecting more detailed data on each of the companies, so that we can further refine our decisions on whether they should be included/excluded; and

319.2 whether separate electricity/gas samples should be used (as suggested by Oxera). For example, if differences in asset betas between the electricity and gas sub-samples persist over time, the case for using separate samples may be strengthened.

320. The alternative approaches to comparator sample selection are discussed in more detail in Attachment B.

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

321. 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.[215]

322. 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:[216]

322.1 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

322.2 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 unforecast changes in cost/volumes, while the consumer price remains unaffected.

323. However, we were not aware of any empirical evidence that demonstrated what adjustment should be made for regulatory differences, or of any overseas regulators

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214 As noted in paragraph 671, we also intend to carefully examine the evidence of whether a WACC percentile uplift has delivered benefits to consumers in both the electricity and gas sectors in the next IM review.

215 Form of control is discussed in more detail in topic paper 1. Commerce Commission "Input methodologies review decisions: Topic paper 1 – Form of control and RAB indexation for EDBs, GPBs and Transpower" (20 December 2016).

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

making an adjustment. Therefore, we decided against making any adjustment to asset beta for regulatory differences.[217]

324. 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:

    324.1 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…";[218] and

    324.2 CEG (for the ENA) noted that "it is very hard to find an effect of the form of regulation on measured asset betas".[219]

325. 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".[220]

326. 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".[221] Dr Lally noted that:[222]

> …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.

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

    327.1 Wellington Electricity submitted that "Dr Lally's conclusion that there is no empirical evidence to support different asset betas for different price control

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

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

219 CEG "Asset beta" (report prepared for ENA, February 2016), para 64.

220 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.

221 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. 24.

222 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. 19-20.

regimes provides further support for no adjustment to the asset beta for form of control";[223] and

327.2 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".[224]

328. Contact, on the other hand, submitted that consumers should see offsetting benefits from the movement to a revenue cap, given that this is expected to reduce systematic cash-flow risk of EDBs.[225]

329. However, 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.

330. 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.

331. 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 407 to 410.

332. As a result of these difficulties, and Dr Lally's advice, we have not made an adjustment to our asset beta estimate of 0.35 due to regulatory differences.[226] Although in principle regulatory differences could potentially have an effect on asset beta, we consider that there is insufficient evidence to support making an adjustment.

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

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

225 Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 27.

226 Submissions on our draft decision generally supported this approach. For example, see: ENA "Input methodologies review – Topic paper 4 cost of capital issues – Submission to the Commerce Commission" (4 August 2016), para 78; PwC "Submission to the Commerce Commission on input methodologies review: Draft decisions papers" (4 August 2016), para 80; Aurora "Submission – Input methodologies review: Draft decision and determination papers" (4 August 2016), p. 7; Orion "Submission on input methodologies review – draft decisions" (4 August 2016), para 42; Transpower "IM review: Submission on suite of draft decision papers" (4 August 2016), section 4.4; and Vector "Submission to Commerce Commission on the IM review draft decision and IM report" (4 August 2016), para 128.

We have applied the same asset beta for electricity distribution and transmission

333. Ireland, Wallace & Associates (**IWA**) (for MEUG) submitted that the asset beta for Transpower should be reduced below the draft decision of 0.34. IWA submitted that the terms of the Transpower Works Agreement (**TWA**) allocate a substantial component of systematic risk to the customer, without adjusting Transpower's asset beta accordingly.[227] IWA stated:[228]

> Transpower proposes to transfer to customers any potential adverse changes in regulatory laws, changes in tax rates and rates for depreciation, change in government stock rate affecting WACC, etc.
>
> As a result, Transpower bears potentially minimal systematic risk yet it has based charges on an asset beta 0.34. As an example, assuming a zero asset beta the midpoint WACC of 4.81% reduces by 2.39% to 2.42%. Given the risk passing to customers, the asset beta should be somewhere between an asset beta of 0.34 and zero. It certainly should not be not left at 0.34.

334. We have decided to continue to apply the same asset beta estimate of 0.35 for both EDBs and Transpower. We note that:

334.1 The TWA referenced in IWA's submission is in draft form, and contracts under the TWA are not subject to price control regulation.[229] Consequently the value of these contracts are not subject to the allowed regulatory WACC.[230]

334.2 The new investment contracts covered by the terms of the draft TWA only represent a small proportion of Transpower's overall capital expenditure. For example, for the disclosure year ended 30 June 2016, the total estimated build cost of new investment contracts was approximately $1.5m, compared to total base capex commissioned of $172.2m.[231]

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227 IWA indicated that the two main systematic risks transferred to consumers under the TWA would be "…the shocks from increases in term interest rates and tax rates…" noting that "…[t]hese two factors are the drivers of changes in the 'regulatory WACC' and hence utility type investments generally". IWA (report prepared for MEUG) "Input methodologies review draft decisions – Risk allocation between suppliers and customers" (4 August 2016), para 3.11.

228 IWA (report prepared for MEUG) "Input methodologies review draft decisions – Risk allocation between suppliers and customers" (4 August 2016), Appendix B, para 8-10.

229 IWA (report prepared for MEUG) "Input methodologies review draft decisions – Risk allocation between suppliers and customers" (4 August 2016), para 3.8 and Appendix B, para 1.

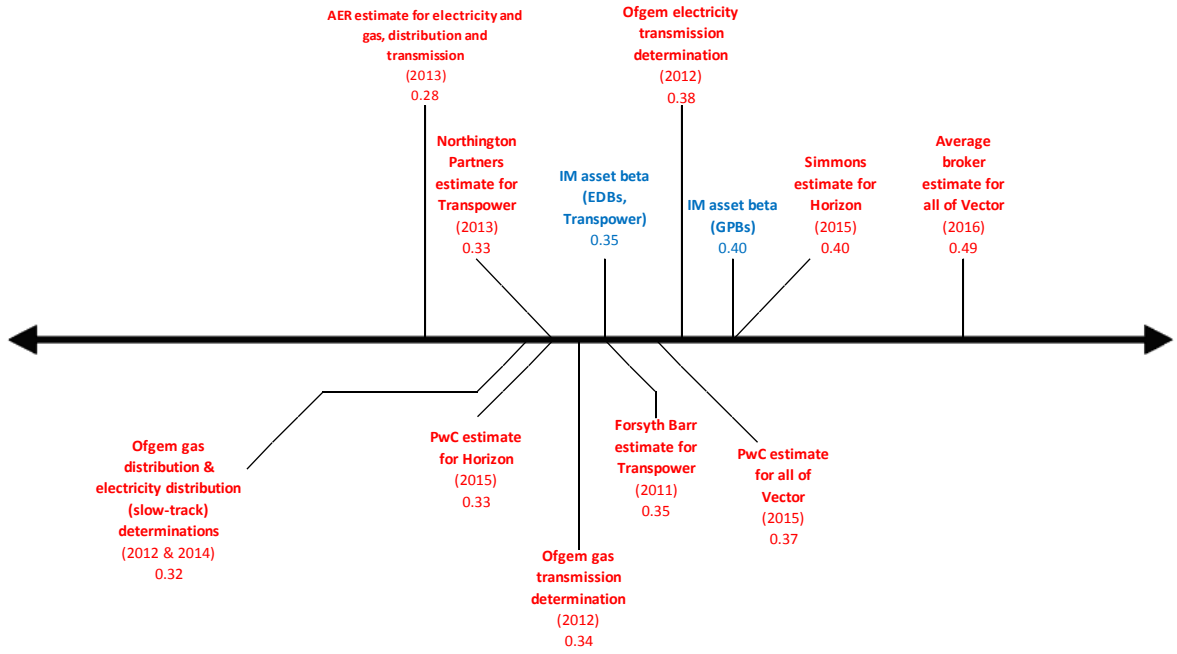
230 IWA noted that the TWA is referenced as a "new investment contract" in the Transpower IM determination. Under the IMs, the value of assets created under new investment contracts is excluded from the RAB. *Transpower Input Methodologies Determination* 2012 [2012] NZCC 17, clause 2.2.7(1)(d).

231 Transpower Information Disclosure Schedules F1-6, G1-8, SO1 (with additional schedules added by Transpower), for the disclosure year ended 30 June 2016.

Reasonableness of our asset beta estimate of 0.35 for EDBs and Transpower

335. We have compared our unadjusted asset beta estimate of 0.35 against a range of estimates from other sources, as shown in Figure 6 below.

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



336. Contact submitted that comparisons with asset betas from other jurisdictions are incorrect, because the effective asset beta for New Zealand is higher due to use of the 67th percentile.[232] Contact submitted:[233]

> Given the overseas jurisdictions do not use a 67th percentile methodology, the final beta of other jurisdictions should be compared to NZ final beta before adjusting for the 67th percentile movement.

337. However, we disagree with Contact's submission. In our view, use of the 67th percentile should not affect our underlying asset beta estimate, given:

337.1 0.35 is our best estimate of asset beta, and the available comparative information suggests this is reasonable;[234]

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232 We also note that Oxera stated at the WACC workshop that "…you are setting a WACC percentile which is above your central estimate, so that will be part of the value that will be institutionalised within the regulated revenue building blocks…". Commerce Commission "WACC workshop transcript" (September 2016), p. 147.

233 Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 26.

234 MEUG submitted that changes in asset beta can result in material changes in charges to consumers, noting that it estimates a 0.01 change in asset beta changes consumer payments by $18m per annum. We agree that changes in asset beta can have a material impact on the allowed WACC, and therefore,

337.2 the 67th percentile adjustment is a separate decision, which involved trading off the likely costs and benefits arising from a WACC that is too low compared to a WACC that is too high;[235]

337.3 the 67th percentile adjustment was widely consulted on in 2014, and we explained in that decision why we considered the percentile adjustment could be reviewed separately from other aspects of the cost of capital IMs;[236] and

337.4 we have undertaken separate reasonableness checks on our overall WACC estimates, including the 67th percentile adjustment, as discussed in Chapter 7.

Re-levering the average asset beta into an equity beta

338. For the reasons explained above, we have determined an asset beta of 0.35 for EDBs and Transpower. Combining this with a notional leverage estimate of 42% (as explained in paragraphs 546 to 572), results in an equity beta of 0.60.[237]

We have determined an asset beta of 0.40 for GPBs

339. When determining the asset beta for GPBs, we have made a 0.05 upwards adjustment relative to the asset beta for EDBs and Transpower. This leads to an asset beta for GPBs of 0.40.

340. As described above, our primary approach to estimating asset beta is to calculate the average of our comparator sample of 72 energy businesses. The average asset beta of our comparator sample is 0.35, which reflects an average across both electricity and gas businesses.

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payments by consumers. However, we note that: (1) 0.35 is our best estimate of asset beta for EDBs and Transpower, based on the comparator sample analysis we have undertaken; and (2) although our asset beta estimate for EDBs and Transpower has increased from 0.34 to 0.35, the equity beta has decreased from 0.61 to 0.60 (due to the decrease in leverage from 44% to 42%). MEUG cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Second cross submission on input methodologies draft review decisions" (25 August 2016), para 9(a).

235 We noted that "the main reason to set a WACC percentile above the mid-point is to mitigate against the risk of under-investment relating to service quality generally, and contributing to major supply outages in particular". Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services: Reasons paper" (30 October 2014), para X18.

236 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 4.18-4.41.

237 We have calculated the equity beta using the re-levering formula in paragraph 295.2:
$\beta e = \beta a + (\beta a - \beta d)L/(1-L)$

where βa is the average asset beta of 0.35, βd is the debt beta (which we have assumed to be 0), and L is the average leverage of 42%.

341. In the 2010 IMs decision, we concluded that the asset beta for gas pipeline services was likely higher than for electricity lines services. We made an upwards adjustment of 0.10 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 0.10 higher than for EDBs and Transpower.

342. In contrast, our draft decision was that the same asset beta should apply to EDBs, Transpower and GPBs. We stated that:[238]

> …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.

343. After examining the available evidence, we now consider that an asset beta for gas pipelines that is 0.05 higher than for electricity lines is appropriate. Although we now consider the case for a gas asset beta adjustment is weaker than we did in 2010, several factors provide support for a small upwards adjustment.

344. When reaching our final decision to apply an upwards adjustment for GPBs we have given most weight to the following two factors. Although neither of these factors are sufficient to support an uplift in isolation, when combined, we consider they support making an upwards adjustment of 0.05.

    344.1 Gas has a higher income elasticity of demand than electricity, which would typically be expected to lead to a higher asset beta (however, the magnitude of the effect is unclear). Although we consider that the presence of price/revenue cap regulation is likely to dampen this effect, it still provides some support for a gas asset beta uplift.[239]

    344.2 A low proportion of New Zealand households are connected to gas, relative to other countries in our comparator sample. This potentially increases the risk of economic network stranding for GPBs (which is likely to be at least partly systematic in nature) relative to EDBs/Transpower,[240] and suggests that greater growth options will exist (although the value of these growth options

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238 Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 333.

239 The impact of regulation on the relationship between income elasticity of demand and asset beta is discussed further in paragraphs 407 to 416 below.

240 However, it is not clear to us whether this risk has materially increased for GDBs since we set the IMs in 2010, as discussed in the emerging technology topic paper. Commerce Commission "Input methodologies review decisions, Topic paper 3: The future impact of emerging technologies in the energy sector" (20 December 2016).

will be significantly limited by regulation, once prices are reset for the following regulatory period).[241]

345. The results of our asset beta comparator sample also provide limited support for an upwards adjustment to the gas asset beta. In particular, focussing on the difference between the results for the gas sub-sample relative to the whole energy sample, data for the most recent 10 years suggests a gas asset beta uplift is appropriate. However, data for the previous 10 years does not.

346. The rest of this section discusses:

346.1 why we considered it important to re-assess the evidence for a gas asset beta uplift as part of this review;

346.2 why we have determined the gas asset beta by considering adjustments to the energy comparator sample, rather than focussing on the gas sub-sample (as suggested by First Gas and Oxera);

346.3 the results for the gas asset beta sub-sample, relative to energy and electricity samples;

346.4 income elasticity of demand for gas (relative to electricity), and the potential impact on asset beta in the context of price/revenue cap regulation;

346.5 the relatively low penetration of gas networks in New Zealand, including why this is likely to lead to higher asset stranding risk (and greater growth options, although the value of these will be significantly limited by regulation);

346.6 overseas regulatory precedent, which generally supports using the same (or a very similar) asset beta for electricity lines and gas pipelines; and

346.7 Dr Lally's reasons for no longer recommending using a higher asset beta for gas pipeline businesses.

[241] As noted in paragraph 426 below, the relatively low penetration of gas in New Zealand means that gas pipelines are closer to the 'death spiral' tipping point, where gas networks could lose enough customers to make getting the remainder to pay infeasible. This suggests investors' perception of stranding risk may be more correlated with the market for gas than electricity, leading to a higher asset beta.

We are required to re-assess the evidence for a gas asset beta uplift

347. In 2010 we applied an asset beta for GPBs that was 0.10 higher than for EDBs and Transpower, based on:[242]

347.1 evidence we had, including submissions and advice from Dr Lally (provided in 2008) recommending a 0.10 uplift for GPBs, due to differences in customer types, the nature of the product, and more valuable growth options; and

347.2 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).

348. At the time, we noted that other evidence suggested that "…the IM may be considered favourable to GPBs". In particular, we noted that:[243]

348.1 the AER and Ofgem generally used the same, or very similar, asset beta/WACC estimates for electricity and gas;

348.2 empirical estimates from our comparator sample produced an asset beta for gas companies that was lower than for electricity companies; and

348.3 NERA had noted that the regulated equity premium for US electricity utilities was identical to that for US gas utilities over 1996-2010.

349. 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".[244] We also stated (emphasis added):[245]

> 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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242 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H8.167-H8.179.

243 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H13.71-H13.74.

244 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H13.74.

245 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H8.179.

350. In response to our draft decision proposing to remove the 0.10 asset beta uplift for GPBs, First Gas submitted:[246]

> …the Commission has clearly stated that it will only make changes to IMs where there is a clear need to do so – in essence, where the current IMs are not fit for purpose.
>
> We do not consider that reducing the asset beta for gas pipelines as part of the IMs review would be faithfully applying this approach given that:
>
> - No party has suggested that the current gas asset beta is not fit for purpose. […]
> - The empirical evidence supports the current gas asset beta. […]

351. Similarly, First State Investments submitted:[247]

> We are interested to better understand the Commission's views on how changing the gas asset beta as part of this IMs review would fit with its own decision-making framework.
>
> …we firmly believe that a reduction in the gas asset beta would be contrary to the decision-making framework for the IMs review.

352. Powerco also submitted that:[248]

> The development of the cost of capital topic up to this point created a legitimate expectation on the part of suppliers that the Commission, having canvassed the issues, had identified a limited scope to take forward in the review. It also created a legitimate expectation that the Commission would have regard to its decision-making framework, and its stated intention to preserve regulatory certainty, in deciding what aspects of the cost of capital estimate required amendment.
>
> …if the Commission properly applies the decision-making framework it has established for this review, it will conclude that revisiting these issues will not better serve the Part 4 purpose in s 52A, or the IMs purpose in s 52R. We therefore invite the Commission to stand back from the detailed methodological debate that Dr Lally, Contact and First Gas are trying to initiate, and instead consider whether their comments provide a sufficient basis to displace regulatory certainty.

353. We note the following points, which are also articulated in the framework paper, in response to these submissions.[249]

    353.1 The s 52R purpose of the IMs is not to promote certainty simpliciter, but to promote certainty in the rules which will be applied throughout the

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246 First Gas "Submission on input methodologies review draft decisions: cost of capital issues" (4 August 2016), p. 8-9.

247 First State Investments submission "Input methodologies review: Cost of capital" (4 August 2016), p. 11.

248 Powerco "Cross submission on the Commerce Commission's topic paper 4 – Cost of capital issues" (25 August 2016), para 9 and 14.

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

subsequent regulatory periods. If the promotion of s 52A requires an amendment to the GPB asset beta, s 52R does not constrain this.

353.2 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.[250] Our November 2015 cost of capital update paper noted that we intended to "evaluate evidence on the rationale" for the upward adjustment relative to the asset beta for GPBs.[251]

353.3 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.

354. In its cross submission, Powerco noted that we explained our intention to re-estimate beta in the 30 November 2015 update paper. However, Powerco stated that:[252]

> …we understood that the Commission's proposal did not signal an intent to revisit the methodology, but rather to simply update externally observed parameter values using the existing methodology. That was a sensible approach. There is no compelling reason to revisit the underlying methodology given the extensive debate over this issue in the past, and conversely there is value in demonstrating the Commission's commitment to regulatory certainty.
>
> …
>
> In our view, the revisiting of the uplift for gas beta by Dr Lally is an example of the type of tinkering, in the absence of compelling new information, that detracts from regulatory certainty. More concerning are the proposals from TDB (on behalf of Contact) and Oxera (on behalf of First Gas) to fundamentally revisit the methodology that the Commission uses to estimate beta. These are criticisms that could equally have been raised when the IMs were first promulgated, which suggests they should not constitute a basis for revisiting the methodology now. Certainly, they do not constitute the type of new information or analysis that would warrant re-opening the methodology.

355. We disagree with Powerco's assessment of the November 2015 update paper. That paper clearly signalled that we would be re-estimating asset beta "…using updated

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250 Commerce Commission "Input methodologies review invitation to contribute to problem definition" (16 June 2015), para 253.

251 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), para 2.14.

252 Powerco "Cross submission on the Commerce Commission's topic paper 4 – Cost of capital issues" (25 August 2016), para 11 and 14.

data and re-assessing the comparator companies using a similar six-step process as outlined in the Initial IMs reasons paper". The November 2015 paper also highlighted three main issues that we intended to take into account as part of the review:[253]

355.1 "the difference in asset betas estimated using different sampling frequencies and over different time periods";

355.2 "the justification for any adjustments applied to the asset betas across different sectors"; and

355.3 "the extent to which the form of control should impact our assessment of the asset beta".

356. Significant new evidence regarding asset beta (that was not before us in 2010) is now available. For example, new evidence regarding asset beta collected during this review includes:

356.1 updated comparator sample analysis, reflecting additional data through to 31 March 2016;

356.2 evidence regarding the link between income elasticity of demand and asset beta for GPBs, including Houston Kemp's income elasticity modelling;

356.3 evidence regarding differences in gas pipeline services in New Zealand relative to other countries in the comparator sample (including low gas penetration in New Zealand);

356.4 discussion at the workshop, and other additional information provided in submissions, which have enhanced our understanding of the impact of weighted average price cap and revenue cap regulation on asset beta; and

356.5 Dr Lally no longer supports a 0.10 adjustment to the gas asset beta, which he previously recommended in his 2008 advice.

[253] Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), para 2.7-2.10.

357. First Gas submitted that it is "deeply concerned about the impacts of substantially reducing the asset beta on investment in New Zealand's regulatory industries – not just by our shareholders (First State Investments), but by all investors in regulated assets".[254] First Gas stated:[255]

> To face an unsignalled regulatory decision that substantially reduces the equity value of a company within months of significant transactions provides an undesirable indication of the risks that investors are expected to bear in New Zealand's regulated industries. This also has potentially significant adverse impacts on the cost and availability of capital, and will not help to meet gas industry objectives. The Commission has an opportunity reconsider the analysis, approach, conclusions and broader implications of the draft decision based on the evidence provided in submissions.

358. First State Investments submitted that the purpose of Part 4 would not be achieved by reducing the gas asset beta, noting that:[256]

358.1 a material reduction in the gas asset beta would weaken incentives to invest in regulated industries (section 52A(1)(a));

358.2 a material reduction in the gas asset beta would weaken incentives to seek out efficiency gains, particularly through the merger of regulated businesses (section 52A(1)(b)); and

358.3 there is no evidence pointing to excessive profits being earned by gas pipeline businesses at the current regulated WACC (section 52A(1)(d)).

359. Similarly, Oxera submitted that the 0.10 reduction in asset beta proposed in the draft decision would have been an abrupt and significant change brought on by a revised approach (rather than being underpinned or supported by a movement in capital market data). Oxera stated that "…it is desirable to have stable, predictable and consistent tariff-setting policies, by avoiding abrupt changes in regulatory allowed parameters, including the beta".[257]

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254 First State Investments submitted that "[a]ssuming a Regulatory Asset Base for First Gas of $1 billion, the reduction in asset beta amounts to a fall in annual revenue of $7.3 million", and "[a]t the current WACC, such a change would reduce the value of equity in First Gas by around $100 million (or 18% of shareholder funds assuming the rate of leverage historically applied by the Commission of 44%)". First State Investments submission "Input methodologies review: Cost of capital" (4 August 2016), p. 1.

255 First Gas "Submission on input methodologies review draft decisions: cost of capital issues" (4 August 2016), p. 11-12.

256 First State Investments submission "Input methodologies review: Cost of capital" (4 August 2016), p. 10-11.

257 Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 3. Oxera also noted that "…the Commission's own experts have, in the past, explicitly endorsed a need for regulatory stability and consistency", referring to a 2008 recommendation from Professor Franks. Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 3.

360. 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 0.10 asset beta uplift for GPBs has such status that it should not be re-assessed in this review.

360.1 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 348, there was evidence suggesting our approach may be considered favourable to GPBs.

360.2 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.

360.3 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.[258] This will provide firms an expectation of earning a normal return, consistent with FCM.

360.4 Retaining the 0.10 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.

360.5 The High Court has previously noted that "…it is far from obvious that higher than normal expected returns would stimulate greater efficiency of any kind" and "[p]roviding a revenue cushion is not the way to create the right incentives".[259]

360.6 The reasonableness checks we have undertaken indicate the regulatory settings are more than sufficient to compensate investors for putting their capital at risk.[260]

360.7 We do not accept this was an "unsignalled regulatory decision", as suggested by First Gas. As discussed in paragraphs 353.2 and 355 above, we clearly signalled our intention to re-estimate asset beta (including the gas adjustment) as part of this review.

361. Further, we explicitly recognise the potential for estimation error (given the uncertainty in estimating WACC) by using the 67th percentile WACC for price-quality

[258] As discussed in Chapter 2.

[259] Wellington Airport & others v Commerce Commission [2013] NZHC 3289, para 1473.

[260] See Chapter 7 for further details. Figure 6 above also indicates that our asset beta estimate for GPBs of 0.40 is reasonable compared to other estimates.

path regulation. The practical effect of this approach is to adopt a WACC that is higher than our best estimate.

362. Aurora submitted that reducing the gas asset beta has parallels with the WACC percentile, and that "[t]he Commission may want to err on the side of providing or retaining a higher gas beta, even if the evidence on the matter is limited, in order to provide greater surety that gas pipeline businesses will be able to fully recover the cost of their prudent and efficient investment".[261] We disagree. 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.[262]

363. We also note that the 0.10 asset beta uplift for GPBs is not a standalone component of beta. Rather, it resulted from applying our six-step process, as outlined in paragraph 266. The 0.10 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.

364. As part of this review we have retaken each step of the six-step 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.[263, 264]

We have determined the gas asset beta by considering adjustments to the energy sample

365. When determining the asset beta for GPBs, we have considered adjustments to the results for the energy sample to allow for differences in exposure to *systematic* risk between services. 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.

366. As noted above, First Gas and Oxera suggested using separate electricity and gas sub-samples to determine asset beta. This is as opposed to determining the gas asset beta by considering adjustments to the energy sample results. Similarly, GasNet

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261 Aurora "Submission – Input methodologies review: Draft decision and determination papers" (4 August 2016), p. 12.

262 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). As noted in paragraph 671, we intend to carefully examine the evidence of whether a WACC percentile uplift has delivered benefits to consumers in both the electricity and gas sectors in the next IM review.

263 Our six stage process is discussed in further detail in para 266.

264 As discussed in paragraphs 475 to 486, 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.

submitted that "[i]f the 0.1 uplift to the gas asset beta is removed, we support calculating separate asset betas for gas pipeline services and electricity lines services as this would more closely reflect the actual cost of capital for the relevant services".[265]

367. Although we have considered results for the gas sub-sample, we have not used this as our primary approach for determining asset beta for GPBs. We note that:

367.1 the gas sub-sample is relatively small (17 firms), is comprised entirely of US gas companies, and has a greater level of statistical uncertainty than the whole energy sample.[266] The standard error of the asset beta for our gas sub-sample is 0.18, compared with 0.12 for the energy sample (across weekly and four-weekly estimates, over the 2006-2011 and 2011-2016 periods); and

367.2 as shown in Figure 5, the results for the gas sub-sample vary significantly depending on the approach to sample selection. For example, Oxera's refined sample leads to a gas asset beta of 0.46, TRBC leads to 0.40, and applying steps 2 and 3 of TDB's refinements would lead to 0.28. Similar analysis led TDB to caution against the use of the gas sub-sample in isolation, without first reviewing the underlying comparators.[267]

368. At the cost of capital workshop, Pat Duignan and First Gas indicated that the Commission regulates gas pipelines and electricity networks separately, not the energy sector, suggesting that this should frame our approach to estimating asset beta.[268] Pat Duignan noted that the Act has separate subparts for each industry. First Gas stated:[269]

> The Commission does not regulate the energy sector. It regulates gas pipelines and it regulates electricity networks and so, I think that's an entirely appropriate way to frame up the regulatory task that the Commission has and I think a lot of the approach and the decisions that the Commission takes flow from the way that that regulatory task is framed.

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265 GasNet "Submission on input methodologies review draft decisions papers" (1 August 2016), para 11.

266 First Gas' submission noted that gas pipelines in the US have broad characteristics that are generally comparable with pipelines in New Zealand (particularly relative to the UK, where gas networks reach nearly all households). First Gas "Submission on input methodologies review draft decisions: cost of capital issues" (4 August 2016), p. 7. However, although US gas penetration rates may be more comparable to NZ on average, there is likely to be significant variation between states, and the UK is likely to be more comparable in other respects (such as the regulatory regime). Houston Kemp noted that "there are many factors that may influence the comparability of United States firms with those operating in New Zealand, including the operating environment, the financial environment, the nature of consumer preference and the approach to regulation". Houston Kemp (report prepared for Powerco) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Comments on issues raised in submissions" (25 August 2015), p. 10.

267 TDB Advisory Limited (report prepared for Contact Energy) "Submission to the Commerce Commission on the input methodologies review draft decisions: Comparative company analysis" (4 August 2016), p. 7.

268 Commerce Commission "WACC workshop transcript" (September 2016), p. 28-29.

269 Commerce Commission "WACC workshop transcript" (September 2016), p. 29.

369. We acknowledge that we regulate electricity lines and gas pipeline services separately, and that these services are contained in separate subparts in Part 4. Consistent with this, we have determined separate asset betas for electricity and gas.

370. We consider that the betas of international energy businesses are a useful indicator of the beta of New Zealand gas pipeline services, and note that it has proved difficult to identify a good comparator set for each separate category of services we regulate.[270] Consequently, we consider that the most robust approach to determining the asset beta for gas pipelines is to start with a sample of comparator businesses that operate in the energy sector. We have then considered whether an adjustment is required to reflect differences in exposure to systematic risk between services.

371. In particular, we have considered four main potential reasons for applying an upwards adjustment for gas, which are discussed in more detail below:

    371.1 results for the gas asset beta sub-sample, relative to the electricity sample and the full energy sample;

    371.2 gas generally has a higher income elasticity of demand than electricity, and is likely to be more discretionary in New Zealand than some other countries (such as the UK);

    371.3 gas penetration is relatively low in New Zealand relative to other countries included in the comparator sample analysis, potentially leading to greater economic stranding risk than electricity (which could have a systematic component) and greater growth options; and

    371.4 international regulatory precedent regarding the relativity between gas and electricity asset betas.

Results for the gas asset beta sub-sample, relative to energy and electricity

372. In its submission on the draft decision, Oxera stated that asset betas for gas companies in our comparator sample have remained consistently higher than asset betas for electricity companies since publication of the 2010 IMs decision. Therefore, Oxera submitted that removing "…the existing uplift of 0.10 on the asset betas for gas pipeline businesses runs counter to how the market evidence on asset betas have evolved".[271]

373. Although Houston Kemp (for Powerco) considers that gas network businesses are likely to experience higher systematic risks than electricity businesses in

[270] As noted in paragraph 367, we have concerns regarding the small size and variability of using a gas only sample.

[271] Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 1.

New Zealand, it raised concerns about relying on a sample of overseas businesses dominated by United States firms to reach this conclusion. Houston Kemp stated:[272]

> There is considerable evidence pointing towards there being little difference in systematic risks between electricity and gas businesses in the United States. This evidence includes:
>
> - CEG's 2013 survey, which found that for mostly regulated businesses, there was little difference in asset beta between electricity and gas network businesses. Similarly, TDB notes that much of the higher gas betas in the United States may be explained by significant unregulated activities, such as exploration; and
>
> - results of surveys of income elasticity of demand for electricity and gas in the United States, including those conducted by the Commission, which suggest that one should not expect there to be much difference in systematic risks between suppliers of electricity and gas services.

374. Methanex supported the draft decision to align the asset beta for GPBs to the electricity asset beta, given a lack of compelling empirical evidence to justify the uplift. Methanex noted that "…variations in the difference between electricity and gas asset betas over time are more likely to reflect measurement error than any fundamental, identifiable and systematic difference between the services provided".[273]

375. We have compared asset betas for electricity and gas sub-sets of our updated comparator sample, across the most recent 20 year period (1996-2016). We have classified the companies included in the comparator sample as either electricity, gas or integrated based on Bloomberg company descriptions.

376. Figure 7 below compares average asset betas for the full energy sample with the electricity, gas and integrated sub-samples, calculated assuming a zero debt beta. Although this analysis suggests a higher asset beta for gas companies in the most recent 10 years (2006-2016), the data for the 1996-2006 period does not.

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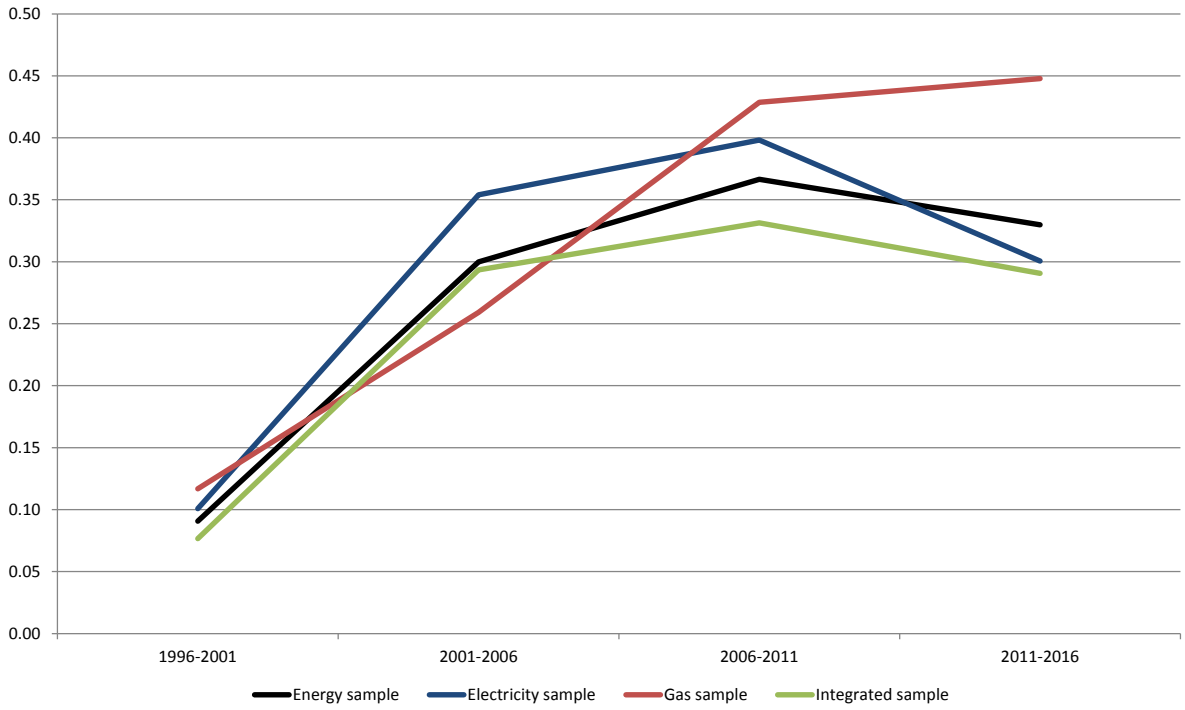
[272] Houston Kemp (report prepared for Powerco) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Comments on issues raised in submissions" (25 August 2015), p. 11.

[273] Methanex "Input methodologies review and gas DPP consultation submission by Methanex New Zealand Limited" (4 August 2016), p. 3-4.

Figure 7: Comparison of sub-samples over time (assuming zero debt beta)



377. First Gas submitted that "[f]rom the time since the IMs were first determined in December 2010, observed asset betas for gas pipelines have remained at or above 0.44", noting that:[274]

> Empirical beta estimates based on observed asset betas for gas pipelines (i.e. excluding electricity comparators) are statistically sound and have been remarkably stable over the past 8 years, providing confidence when setting a forward-looking beta estimate. A materially better approach to beta estimation given this evidence would be to rely on the more relevant comparator set of gas pipelines and leave the gas asset beta unchanged.

378. While we agree that the average asset beta for the gas sub-sample has been higher than the electricity sub-sample (and the whole energy sample) in recent years, the relationship flips over time (for no obvious reason).[275] Further, given that the average standard error of the asset beta for the gas sample is approximately 0.18 over the most recent 10 years (as noted in paragraph 367.1 above), it is not clear that there is a statistically significant difference between the results of gas sub-sample and the whole energy sample.

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274 First Gas "Submission on input methodologies review draft decisions: cost of capital issues" (4 August 2016), p. 1.

275 The ENA noted that "No submitter has provided a credible basis for believing that gas businesses in the sample set have only recently, in the last five years, experienced an increase in risk relative to electricity businesses". ENA "Input methodologies review draft decisions – Cross submission on cost of capital" (25 August 2016), para 44.

379. In its submission, First Gas stated that "the standard errors using the gas and electricity sub-samples are comparable to those resulting from the larger dataset", and suggested that the gas sub-sample results in a standard error that is "much lower than the standard error of asset beta estimates for airports information disclosure".[276] However, we note that the standard error of the asset beta for our gas sub-sample of 0.18 is higher than the standard error of the asset beta we use for airports (0.16), and the standard error of the asset beta for our refined energy sample (0.12).[277]

380. First Gas also noted that adding the standard error of the electricity sub-sample to the average asset beta of the electricity sub-sample would give an upper bound that is much lower than the average asset beta for the gas sub-sample.[278] However, we note that First Gas' conclusion does not hold if the analysis is undertaken in reverse. Using our refined sample for this final decision, and averaging across weekly and four-weekly estimates over the 2006-2011 and 2011-2016 periods:

    380.1 Subtracting the standard error of the asset beta for the gas sub-sample (0.18) from the average asset beta of the gas sub-sample (0.44) results in 0.26.

    380.2 This is significantly below the average asset beta for the electricity sub-sample of 0.35.

381. Further, CEG and Major Gas Users Group (**MGUG**) submitted that there is no statistically significant difference between the average asset betas for electricity and gas.[279] CEG submitted that:[280]

    381.1 comparisons of the Commission's asset beta made by TDB (across individual firms) and Oxera (across sub-samples of firms) cannot meaningfully be done unless the firms/sub-samples have the same gearing;

    381.2 in order for it to proceed without error, debt betas must be estimated for individual firms;

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276 First Gas "Submission on input methodologies review draft decisions: cost of capital issues" (4 August 2016), p. 3-5. First Gas also submitted that Australian regulatory experience suggests that the Commission should "refine its sample to a shorter list of comparators in similar markets and with broadly similar regulatory controls" (p. 10-11). However, we have not based on asset beta estimate for GPBs on the gas sub-sample, for the reasons in paragraphs 367 to 370 above.

277 The standard error of the asset beta for airports is discussed in more detail in paragraphs 589 to 595.

278 First Gas "Submission on input methodologies review draft decisions: cost of capital issues" (4 August 2016), p. 4-5.

279 CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), para 56-71.

280 CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), para 10-13.

381.3 when plausible estimates of debt beta are used much of the apparent variation relied on by TDB and Oxera to reach their conclusions disappears;

381.4 the apparent differences in gas and electricity betas identified by Oxera is largely a function of the use of zero debt betas and the use of the most recent five-year period; and

381.5 there is no statistically significant difference between gas and electricity betas when a longer time-horizon is examined.

382. CEG applied a series of two-sample t-tests to compare the average asset betas for gas and electricity businesses. Using the average of weekly and 4 weekly estimates, across three time periods (2001-2006, 2006-2011, and 2011-2016) CEG found that:[281]

382.1 the 2011-16 period has statistically significantly higher gas asset betas using a zero debt beta but not if positive debt betas are used;

382.2 in 2001-06 gas asset betas are statistically significantly lower than electricity asset betas – even when no debt beta adjustment is applied;

382.3 in the middle period (2006-11) there is no statistically significant different between gas and electricity assets betas – irrespective of whether a debt beta adjustment is applied; and

382.4 combining these periods in a number of different ways, all estimates using a positive debt beta find no statistically significant difference, and three out of four tests with a zero debt beta find no statistically significant difference.

383. We agree with CEG that assuming non-zero debt betas will allow more valid comparisons across individual firms. Using non-zero debt betas helps ensure comparability among individual firms with different levels of gearing.

384. However, we disagree with CEG's assumption that "…for each individual firm, its debt beta is zero if the gearing is less than 30%, and increases with gearing above 30% to a maximum of 0.3".[282]

[281] CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), para 57-63.

[282] CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), para 29.

385. At the cost of capital workshop Dr Lally noted that:[283]

385.1 a model that recognises a debt beta is, in principle, a better one than one that does not;

385.2 relatively high debt betas, such as 0.3, are likely to reflect contamination from the risk-free rate. Debt betas are about the debt risk premium component, not the risk-free rate component because the risk-free rate is, by definition, free risk;[284]

385.3 a sensible estimate, after removing contamination from the risk-free rate, is between 0 and 0.1; and

385.4 once debt beta estimates are at a sensible level, incorporating them into the model has very little effect on the results, so it is not worth the trouble of incorporating them.

386. Oxera (for First Gas) provided a response to CEG's cross submission, following the cost of capital workshop. Oxera submitted that:[285]

386.1 the maximum level of debt beta that CEG assumes (0.30) is implausibly high for electricity networks and gas pipeline businesses in New Zealand;

386.2 CEG assumes an implausibly steep increase in debt betas for firms with gearing levels of 30-50%, noting that under CEG's assumption, increasing gearing from 50% to 90% would not increase the debt beta of a firm;

386.3 academic evidence and regulatory precedents support much lower debt betas than those assumed by CEG;

386.4 if more realistic assumptions of debt beta were adopted, this would not materially affect the overall conclusions that the gas asset beta is higher than the electricity beta; and

386.5 for the purpose of illustration, Oxera used an "aggressive (i.e. high)" assumption that debt beta varies linearly between 0 and 0.2 for firms with gearing between 0% and 90%.

387. We consider Oxera's illustrative debt beta assumption is more realistic than CEG's, so have used this assumption when comparing sub-samples in Figure 8 below.[286]

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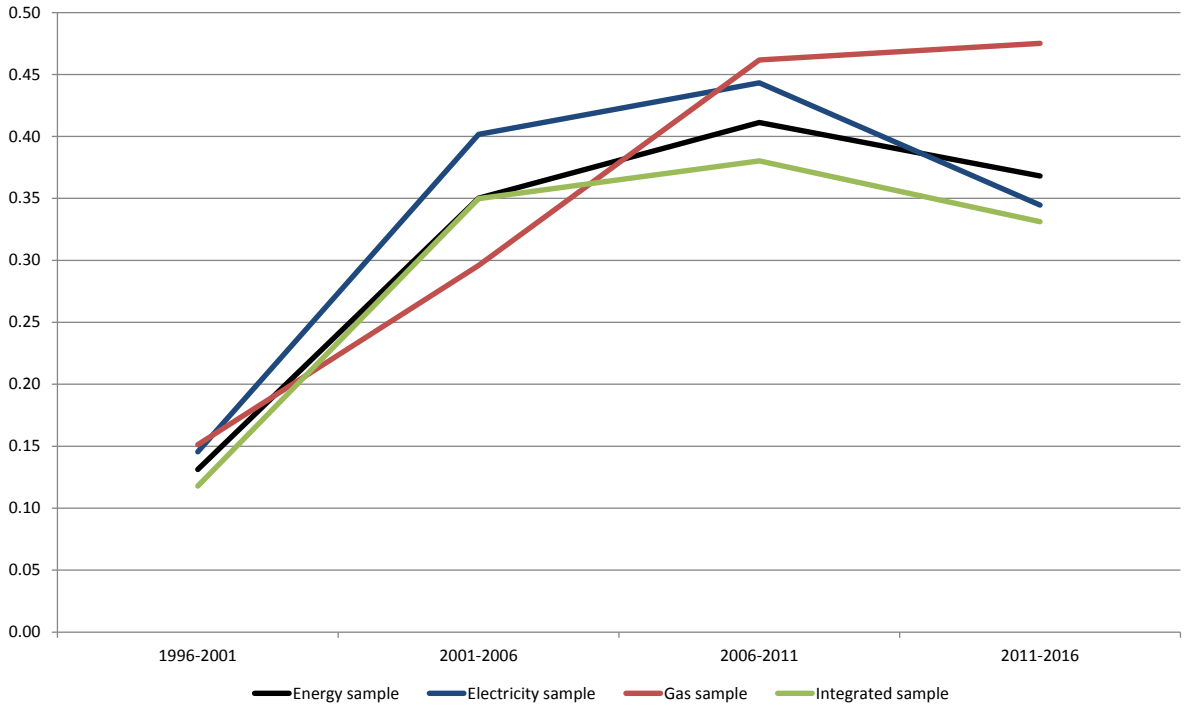
283 Commerce Commission "WACC workshop transcript" (September 2016), p. 34-35.

284 Dr Lally referred to a paper from Schaefer and Strebulaev as an example of empirical debt beta estimates which remove the interest rate risk component. Schaefer and Strebulaev "Structural models of credit risk are useful: Evidence from hedge ratios on corporate bonds", *Journal of Financial Economics* 90 (2008) 1-19. Table 4 shows a debt beta estimate of four basis points for a BBB rated business.

285 Oxera (report prepared for First Gas) "Oxera response to CEG's cross submission: The debt beta for gas pipeline businesses" (19 September 2016), p. 2-3.

However, we consider that Oxera's approach leads to relatively high debt betas, given it results in an average debt beta across our full comparator sample of 0.09 (which is near the top end of the range of 0 to 0.10 referred to by Dr Lally as noted in paragraph 385.3 above, and more than double Schaefer and Strebulaev's estimate of 0.04 for a BBB rated business as noted in footnote 284).[287]

Figure 8: Comparison of sub-samples over time (assuming non-zero debt beta)



388. Using the TRBC, in combination with Oxera's debt beta assumption, further dampens the differential between the gas and energy samples. This is shown in Figure 9 below.

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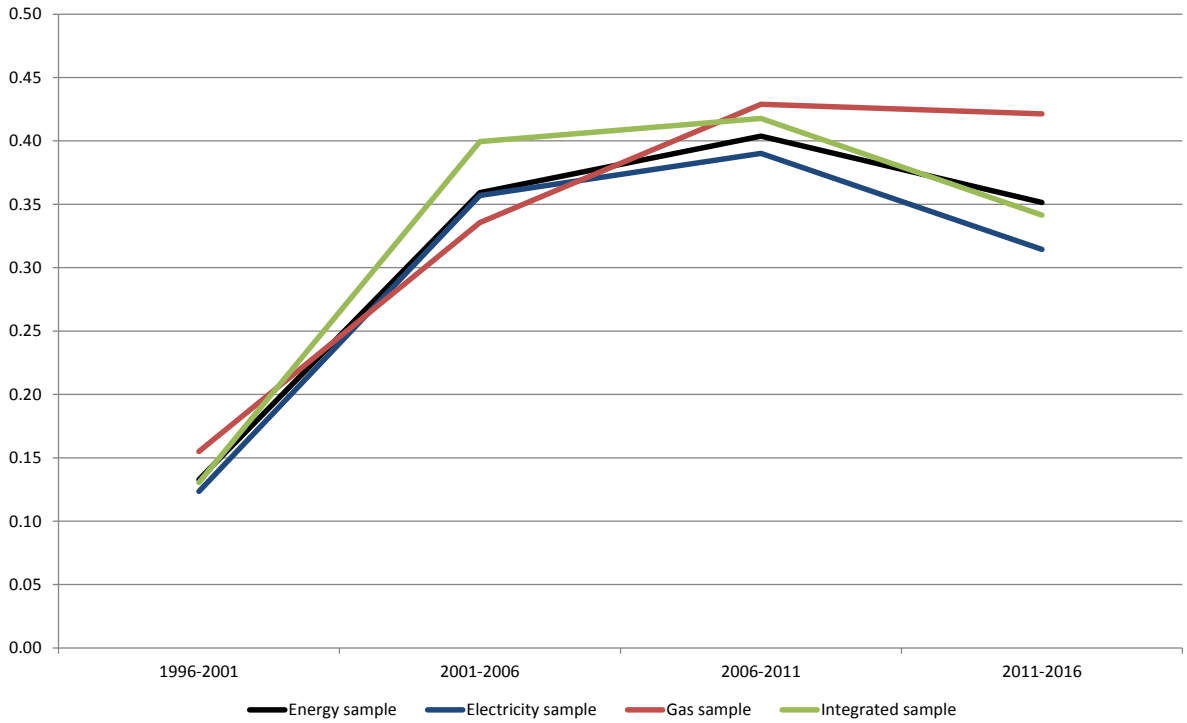
286 Conceptually, from an equity shareholder's point of view, a company having debt is like the shareholders having a put option of the company to the debt providers. Therefore, viewed in terms of optionality, we would expect a non-linear relationship between leverage and debt beta, where debt beta would remain low at relatively low levels of leverage, but then increase significantly as leverage approaches levels where bankruptcy or debt default becomes a realistic prospect.

287 CEG subsequently considered sensitivities regarding several other possible debt beta assumptions. However, we consider these additional sensitivities also lead to relatively high debt betas (given CEG assumes higher debt betas than Oxera). CEG (report prepared for ENA) responding to Oxera debt beta note "Review of Oxera debt beta analysis" (October 2016).

Figure 9: Comparison of sub-samples over time using TRBC (assuming non-zero debt beta)



389. Overall, we consider that the comparator sample analysis provides some limited support for an upwards adjustment to the gas asset beta. However, this is primarily because we have focussed our analysis on the most recent 10 years (2006-2016). When weight is given to the previous 10 year period (1996-2006), in addition to the 2006-2016 period, the case for using a higher asset beta for GPBs is relatively weak.

390. We note that in its analysis of CEG's cross submission regarding debt betas, Oxera concluded that "[e]ven under the assumptions of non-zero debt betas, the results support a regulatory allowed asset beta of at least 0.40 for gas pipeline businesses".[288]

Gas has a higher income elasticity of demand than electricity

391. 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:[289]

> 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.

[288] Oxera (report prepared for First Gas) "Oxera response to CEG's cross submission: The debt beta for gas pipeline businesses" (19 September 2016), p. 7.

[289] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para 6.4.3.

392. 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 somewhat more discretionary than for electricity.[290] Suppliers of gas pipeline services recognise the possible loss of volumes if consumers were to switch energy demand to other fuel types.[291]

393. However, it is not clear that gas having a higher price elasticity of demand than electricity 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. Some aspects of the demand risks faced by GPBs are non-systematic in nature, and can be mitigated through diversification. For example:

    393.1 If the cost to consumers of reticulated gas were to increase, this might cause some consumers to switch to alternative fuels (such as bottled gas, coal or electricity). In this event, the GPB would experience lower volumes.[292] 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.[293]

    393.2 However, the risk of switching to alternative fuels is non-systematic, given that it will not matter to a diversified investor. A diversified investor 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.

394. 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:[294]

> 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

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290 Vector "Pricing Methodology for Gas Distribution Services" (effective from 1 October 2015), p. 11.

291 Vector "Pricing Methodology for Gas Distribution Services" (effective from 1 October 2015); and Powerco "Gas Distribution Pricing Methodology" (24 September 2015).

292 Vector "Pricing Methodology for Gas Distribution Services" (effective from 1 October 2015), p. 11-12.

293 The 2004 study of energy demand elasticities for OECD countries referred to in paragraph 399 below includes the following *price elasticity* estimates for electricity and natural gas. Gang Liu "Estimating Energy Demand Elasticities for OECD Countries - A Dynamic Panel Data Approach" (March 2004), p. 12-13.

	Residential sector		**Industrial sector**	
	Short-run	**Long-run**	**Short-run**	**Long-run**
Electricity	-0.030	-0.157	-0.013	-0.044
Natural gas	-0.102	-0.364	-0.067	-0.243

294 Powerco "Gas Distribution Pricing Methodology" (24 September 2015), p. 22.

> 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.

395. Investors can also diversify the risks associated with consumers switching between alternative fuels, by investing in companies supplying a range of services.

396. 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.[295] Although there is a risk to the volume of gas transported by gas pipelines, this risk can be mitigated through diversification (to the extent it is non-systematic).

397. 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.

398. 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.[296] 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).

399. Gas typically has a higher income elasticity of demand than electricity. For example, a 2004 study of energy demand elasticities for OECD countries found the short-run and long-run income elasticities shown in Table 2.[297] This study was referenced in our draft decision, and in the March 2016 submission from First State Investments.[298]

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295 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.

296 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.

297 Gang Liu "Estimating Energy Demand Elasticities for OECD Countries - A Dynamic Panel Data Approach" (March 2004), p. 12-13. 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.

298 First State Investments "Comments on Professor Lally's review of WACC issues" (24 March 2016), Table 4.1, p. 10.

Table 2: 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

400. In general, a higher income elasticity of demand is expected to lead to a higher asset beta. At the cost of capital workshop, Dr Lally stated "[w]ithout getting into debates on the size of the effect, the direction is uncontroversial".[299] Dr Lally has also previously noted that:[300]

> Firms producing products with low income elasticity of demand (necessities) should have lower sensitivity to real GNP shocks than firms producing products with high income elasticity of demand (luxuries), because demand for their product will be less sensitive to real GNP shocks.

401. 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 (0.35).

402. Houston Kemp previously estimated income elasticities of demand of 3.6-3.8 for residential gas and 1.4-1.2 for commercial gas, which are considerably higher than the estimates for OECD countries contained in Table 2 above. However, in our view limited weight should be placed on Houston Kemp's estimates given the following.

    402.1 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.

    402.2 In several cases, Houston Kemp's results are counter-intuitive. For example, their model suggests that in long-run equilibrium a 1% increase in the price of electricity is associated with a 1.54% decrease in residential gas demand.[301] This is inconsistent with expectations, given that electricity and gas are substitutes.

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299 Commerce Commission "WACC workshop transcript" (September 2016), p. 94.

300 Martin Lally "The weighted average cost of capital for gas pipeline businesses" (28 October 2008), p. 49.

301 Houston Kemp "Asset beta for gas pipeline businesses" (report prepared for Powerco, May 2016), Table 11, p. 19.

402.3 Houston Kemp noted that the Akmal and Stern paper, which it appears to have based its modelling approach on, "…is now relatively old and was not published in a peer-reviewed journal".[302] The Akmal and Stern paper noted similar issues regarding counter-intuitive results, referring to this as a "significant problem".

403. Specifically, the Akmal and Stern paper referred to by Houston Kemp states:[303]

> There is, however, one significant problem with this set of results. Gas demand is estimated to decline with an increase in the price of the residual fuels, holding other factors constant – a finding that is contrary to theoretical expectations. It is generally believed that gas is a very close substitute for wood and heating oil in the area, at least, of space heating, though the residual fuels would rarely be used for cooking or water heating in Australia. It also is a generally held belief that the share of gas in residential energy use has been increasing, primarily at the expense of residual fuels (AGA, 1992).

404. 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:[304]

404.1 the relative lack of availability of some consumption data on a quarterly basis; and

404.2 the length of the time series for annual data, which are only available consistently since 1991.

405. Although we consider limited weight should be placed on the Houston Kemp income elasticity estimates, the fact that Houston Kemp estimates a higher income elasticity of demand for gas than electricity is consistent with expectations.[305] Oxera submitted that "[e]ven if the Commission considers that Houston Kemp's point estimates for the income elasticity of demand for gas in New Zealand are high, the

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302 Houston Kemp "Asset beta for gas pipeline businesses" (report prepared for Powerco, May 2016), Table 11, p. 19.

303 Akmal, A., and Stern. D. "Residential energy demand in Australia – An application of dynamic OLS" (October 2001), p. 15-16.

304 Houston Kemp "Asset beta for gas pipeline businesses" (report prepared for Powerco, May 2016), p. 6.

305 Houston Kemp noted that it does not utilise the absolute level of income elasticity of gas demand from its econometric analysis, but ratios of income elasticities estimated from this analysis. Houston Kemp (report prepared for Powerco) submission on IM review draft decisions papers "Issues raised by the Commerce Commission's draft decision on cost of capital" (4 August 2016), p. 16.

results indicate that the income elasticity of demand for gas is significantly higher than that for electricity".[306]

406. Other things being equal, the higher income elasticity of demand for gas would be expected to lead to a higher asset beta for gas pipelines than electricity lines. However, the magnitude of this effect is unclear, given limited quantitative evidence available.

407. Further, our view in the draft decision was that it is not clear income elasticity of demand will have a material impact on exposure to systematic risk for regulated electricity lines and gas pipeline businesses. This was due to the specific nature of the risks that regulated businesses are exposed to under revenue caps and weighted average price caps, respectively.

408. Under a revenue cap, regulated businesses receive their revenue allowance each year, independent of changes to GDP or incomes. For example:

    408.1 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;

    408.2 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

    408.3 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.

409. Under a weighted average price cap, regulated businesses are exposed to forecast risk, which may dampen their 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:

    409.1 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

    409.2 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

[306] Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 32. Oxera also noted that Houston Kemp's estimates are within the range of income elasticities estimated by Asche et al. (2008) for other countries (see pages 31-32).

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.

410. In particular, regulatory forecasts will remove the effect of *expected* correlations with the market. If both the market and regulated businesses are expected to face good economic conditions, the regulator will factor this into its forecasts, so that the regulated businesses will earn a normal return (while the market will outperform). Therefore, we consider that regulatory forecasts are likely to scale down the overall correlation between returns to regulated businesses and the market.[307]

411. 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".[308] This conclusion was based on similar analysis to paragraph 409. Specifically, Houston Kemp submitted:[309]

> …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.

412. In response to our draft decision, Houston Kemp stated that our view regarding the impact of income elasticity of demand in the context of price and revenue cap regulation is "an extraordinary conclusion to draw", noting that:[310]

> There are other interpretations of that empirical evidence that would lead to different conclusions. Further, the notion that systematic cash flows do not affect asset beta does not appear consistent with empirical evidence that the Commission uses to determine different asset betas across various sectors, including for airports and telecommunications.

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307 To the extent that the regulatory forecast is correct, it removes the expected or forecast correlation between the business' returns and the market. However, any *unexpected* correlation remains, and so would be expected to affect asset beta.

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

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

310 Houston Kemp (report prepared for Powerco) submission on IM review draft decisions papers "Issues raised by the Commerce Commission's draft decision on cost of capital" (3 August 2016), p. 18.

413. Several possible arguments regarding the link between income elasticity and asset beta under price and revenue cap regulation were raised at the workshop. For example:

413.1 Oxera noted that "investors have an extremely long time horizon and investors recognise that regulation does not provide a revenue guarantee".[311] Similarly, Houston Kemp noted that "the long-term fortunes of that business are not insulated by the regulatory arrangements".[312]

413.2 Oxera also noted that "investor perceptions around the risk of political interference in situations where prices might otherwise go up is not trivial", referring to French electricity price resets as an example of how this can potentially affect asset beta.[313]

413.3 CEG noted that regulated businesses might be unwilling to pass on price increases allowed by the regulator in a recession, due to the risk of customers "deserting their gas connection to save money".[314]

414. We note that the number of residential customers switching off their gas connections in a recession is likely to be significantly limited by the cost of replacing their appliances. As Concept Consulting notes:[315]

> …appliance capital costs are significant components of the lifetime costs of energy for space, water and process heating. This means that any defection away from gas is likely to be relatively slow, driven by the replacement cycle of capital appliances which can have lifetimes of 15 to 20 years. However, the corollary of this is that once a space or water heating customer has switched to another fuel, it becomes much harder to win them back.

415. However, Oxera submitted that "high income elasticity of demand for residential consumers could be explained by the fact that consumers in New Zealand have the choice of temporarily disconnecting from the network by turning off the gas valve while remaining physically connected to the network, which is a feature unique to the NZ market". Oxera noted that around 9-11% of total gas connections were temporarily inactive over 2010-2016.[316]

416. Overall, we consider the higher income elasticity of demand for gas provides limited support for an upwards adjustment to the gas asset beta. Although a higher income elasticity of demand is generally expected to lead to a higher asset beta, we consider

311 Commerce Commission "WACC workshop transcript" (September 2016), p. 78.
312 Commerce Commission "WACC workshop transcript" (September 2016), p. 86.
313 Commerce Commission "WACC workshop transcript" (September 2016), p. 89.
314 Commerce Commission "WACC workshop transcript" (September 2016), p. 91.
315 Concept Consulting's submission on the gas pipeline stakeholder meeting "Relative long-term demand risk between electricity and gas networks" (report prepared for Powerco, 27 January 2016), p. 7.
316 Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 33.

that the strength of this relationship is likely to be significantly diminished in the context of economic regulation (for the reasons in paragraphs 407 to 410 above).

417. However, although we consider that the presence of regulation will dampen the relationship between income elasticity of demand and asset beta, we agree that it is unlikely to completely remove this effect.

Gas penetration is relatively low in New Zealand, relative to other countries in the comparator sample

418. A smaller proportion of households are connected to gas in New Zealand, relative to other countries in our comparator sample. For example:

418.1 First Gas noted that gas reaches around 21% of households in the North Island of New Zealand, compared with 56% in the US;[317] and

418.2 Oxera noted that in 2010 approximately 56% of households in Australia, and 86% in the UK, had gas connections.[318]

419. Low gas penetration in New Zealand suggests that greater growth options are available for gas pipelines, relative to electricity lines services. This is because there is greater potential for expansion when the economy is growing (relative to electricity). Other things being equal, this would be expected to lead to a higher asset beta for gas, relative to electricity.

420. However, Dr Lally notes that regulation weakens the value of expansion options, given that expansion is only valuable to the extent it produces revenues in excess of costs).[319] Dr Lally elaborated on this in his most recent response to submissions, stating:[320]

> In the event of a very favourable demand shock, gas businesses may expand their networks, thereby increasing gas consumption indefinitely. Absent regulation, the consumption increment for an indefinite period boosts the net cash flows of the businesses for an indefinite period. By contrast, in the presence of a price cap, the net cash flow boost is curtailed once the current regulatory period expires (in 2.5 years on average), because the price cap would be reduced at that point to neutralize the benefit from the increased demand. So, price cap regulation curtails the value of the growth options, and hence the beta increment for gas over electricity businesses.

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317 First Gas "Submission on input methodologies review draft decisions: cost of capital issues" (4 August 2016), p. 6-7.

318 Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 33.

319 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. 6.

320 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 9.

421. In its submission on the draft decision, Oxera noted that "an expectation or presumption of growth exists in gas pipeline businesses in New Zealand despite the businesses being subject to regulation" given:[321]

421.1 the gas market in New Zealand has low maturity compared with the electricity market;

421.2 gas distribution is subject to a price cap, presumably so that it has an incentive to grow the network;

421.3 it is likely that gas networks in other jurisdictions are more mature than in New Zealand; and

421.4 betas estimated based on comparators from more mature markets may underestimate the betas of gas pipeline businesses in New Zealand, as the volatility faced by gas companies in New Zealand from growth options would not be captured within the comparator sample.

422. We consider that, in isolation, the expansion options are not valuable enough to justify an upwards adjustment to the gas asset beta. When considering the value of expansion options, it is the difference between the regulator's demand forecast and outturns that matters. Even if a business subject to price cap regulation outperforms regulatory demand forecasts, the regulatory settings will be reset within the next five years (further curtailing the value of expansion options).

423. We also note that low gas penetration in New Zealand potentially increases risk of economic network stranding for gas pipelines, relative to electricity lines.

424. As noted in the draft decision, competitive stranding risk is generally non-systematic in nature, and so is not relevant to WACC.[322] 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).

424.1 A decrease in gas demand is offset by increase in demand for alternative technologies, so a diversified investor can manage this risk (to the extent it is non-systematic). This is consistent with October 2015 AER decision for SA Power Networks, which concluded that: "[w]e do not consider the risk arising from disruptive technologies can be reasonably classified as systematic risk".[323]

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321 Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 35-37.

322 Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 359.2.

323 AER "Final decision – SA Power Networks determination 2015−16 to 2019−20, Attachment 3 − Rate of return" (October 2015), D.1.4.

424.2 The possibility of asset stranding for GPBs is discussed further in the emerging technologies topic paper.[324] We note that an asset life adjustment to reflect competitive stranding risk was an option available to GPBs, but there was little support for this in submissions.

425. However, CEG submitted that "the fact that gas distribution has lower penetration and can be expected to be on the steeper part of the average cost curve…" means that "...the likelihood that a reduction in the number of connections to gas transport networks will result in competitive stranding is greater". CEG also noted that:[325]

> We would generally not expect the observed differentials in asset beta to reflect the true cost of competitive stranding. However, when investors' assessment of the likelihood or cost of standing occurring is correlated with the market, firms with greater risk of asset stranding will report a higher beta than firms with lower risk of stranding.

426. We agree that the relatively low penetration of gas in New Zealand means that gas pipelines are closer to the 'death spiral' tipping point, where gas networks could lose enough customers to make getting the remainder to pay infeasible. This suggests investors' perception of stranding risk may be more correlated with the market for gas than electricity, leading to a higher asset beta.

427. Similarly, Oxera submitted that "greenfield network expansion by gas pipeline businesses is expected to be risky, compared with maintenance activities undertaken by mature electricity networks". Oxera stated that there are precedents where regulators have considered uplifting the WACC for greenfield networks, in order to account for risks with uptake.[326]

428. Oxera also noted that the GPB RAB per connection is $7,720, compared with $4,384 for electricity networks, suggesting that:[327]

> An increase in gas tariffs might deter future connections growth and/or hamper gas networks' ability to price up to their cap if customers perceive the tariff increase to be untenable and switch off their gas connection.

429. Dr Lally agreed that "[s]ince such stranding risk is partly systematic, the betas of regulated gas businesses must be higher than regulated electricity businesses". However, Dr Lally considered that the stranding risk is not sufficient to warrant an uplift of 0.10.[328]

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[324] Commerce Commission "Input methodologies review draft decisions: Topic paper 3 – The future impact of emerging technologies in the energy sector" (16 June 2016).

[325] CEG "Relative risk of gas transport services" (report prepared for Vector, March 2016), para 2-3.

[326] Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 37.

[327] Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 37-38.

[328] Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 9.

430. Asset beta should only compensate for stranding risk to the extent it is correlated with the market. However, it is difficult to distinguish between systematic and non-systematic stranding risk.

431. Table 3 below shows what a gas asset beta uplift of either 0.05 or 0.10 would imply in terms of the probability that a gas network is completely stranded in *T* years.[329]

Table 3: Probability a gas pipeline network is completely stranded in T years, implied by asset beta uplift of 0.05 or 0.10

Years (T)	Gas βa uplift = 0.05	Gas βa uplift = 0.10
5	2%	4%
10	4%	7%
15	6%	11%
20	7%	14%
25	9%	17%

432. We note that a 0.10 gas asset beta uplift would suggest relatively high stranding risk (ie, a 17% chance of network being completely stranded in the next 25 years).

433. Overall, we consider that stranding risk for gas is potentially higher than for electricity and some of this is likely to be related to the market (and therefore is systematic risk). We consider this provides support for a small asset beta uplift, but not as large as 0.10.

Overseas regulatory precedent does not provide clear support for a gas uplift

434. Overseas regulatory decisions continue to provide no clear support for applying a higher asset beta for gas pipeline services, relative to electricity lines services. As noted in the draft decision:

434.1 the AER and Ofgem use the same, or very similar, asset betas for electricity and gas; and

434.2 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.

435. 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,

[329] The values in Table 3 are calculated as 1-EXP(-ΔWACC * T). This is similar to analysis we undertook in the pricing reviews for the UCLL and UBA services. Commerce Commission "Further draft pricing review determination for Chorus' unbundled copper local loop service" (2 July 2015), para 1362.

and gas distribution.[330] 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.[331]

436. The explanatory statement for the AER's rate of return guideline states:[332]

> 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.

437. 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.

    437.1 For both gas distribution (RIIO-GD1) and electricity distribution (RIIO-ED1), Ofgem used an equity beta of 0.9 and gearing of 65%.[333] This implies an asset beta of 0.32.

    437.2 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.[334]

438. 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.[335]

    438.1 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.[336]

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330 AER "Better Regulation - Rate of Return Guideline" (December 2013), p 113.

331 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).

332 AER "Better Regulation Explanatory Statement Rate of Return Guideline" (December 2013), p. 83.

333 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).

334 Ofgem "RIIO-T1: Final Proposals for National Grid Electricity Transmission and National Grid Gas - Finance Supporting document" (17 December 2012).

335 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. CEER "CEER Report on Investment Conditions in European Countries" Ref: C15-IRB-28-03 (14 March 2016).

438.2 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).[337]

439. 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.

440. 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:[338]

440.1 "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

440.2 "Ofgem's estimate of the WACC for gas distribution companies is very similar to that for electricity distribution companies".

441. Submissions on the draft decision questioned the relevance of overseas regulatory decisions, given country-specific differences (including different approaches taken by regulators when determining beta). For example:

441.1 First Gas submitted that the UK gas sector has fundamentally different characteristics from New Zealand (with gas networks reaching nearly every premise). First Gas and Australian regulators adopt a different approach to beta analysis, believing that estimates based on a small sample of Australian comparators will be more reliable than a large sample of international comparators.[339]

441.2 Houston Kemp noted that the type of empirical evidence regarding income elasticities that it has provided as part of this process has not previously been submitted in Australia. Houston Kemp also noted that the context is different in Australia, where the AER has historically set the same equity beta for

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336 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"

337 CEG "Relative risk of gas transport services" (report prepared for Vector, March 2016), p. 7-10.

338 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H13.73.

339 First Gas "Submission on input methodologies review draft decisions: cost of capital issues" (4 August 2016), p. 9-10.

electricity and gas networks (as opposed to NZ, where the Commerce Commission has determined a higher asset beta for gas networks since 2004).[340]

442. We agree that comparisons with international regulatory decisions are of limited benefit, given the different contexts within those decisions are made (relative to New Zealand). However, we still consider that international comparisons are worthwhile, primarily as a cross-check on the results of our own findings specific to the New Zealand context.

Dr Lally no longer supports using a higher asset beta for gas pipeline businesses

443. As part of this review, we asked Dr Lally to consider whether the 0.10 upwards adjustment relative to the asset beta for GPBs continues to be appropriate. As set out in his advice, Dr Lally no longer considers that the 0.10 upwards adjustment relative to the asset beta for GPBs is warranted.[341]

444. 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 now regulated, reducing the relevance of this argument.[342]

445. Dr Lally also concluded, based on his empirical analysis, that differences in customer mix do not warrant a higher beta for GPBs.

445.1 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 that was 0.08 higher than for electricity (assuming 'theta' of 0.5), or 0.04 higher (assuming 'theta' of 0.25).[343] 'Theta' captures the extent to which income elasticity explains changes in asset beta.

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340 Houston Kemp (report prepared for Powerco) submission on IM review draft decisions papers "Issues raised by the Commerce Commission's draft decision on cost of capital" (4 August 2016), p. 19-20.

341 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), para 6; 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).

342 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.

343 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.

445.2 However, Dr Lally also noted betas are affected by many other factors.[344] In particular, he advised that "…it is impossible to reliably estimate the difference in the betas of gas and electricity businesses purely on the basis of the two factors considered by Houston Kemp, and the effect of these two factors will be significantly diluted by other factors".[345]

445.3 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 above, we have some additional concerns about Houston Kemp's analysis which further calls into question the magnitude of the estimated difference.

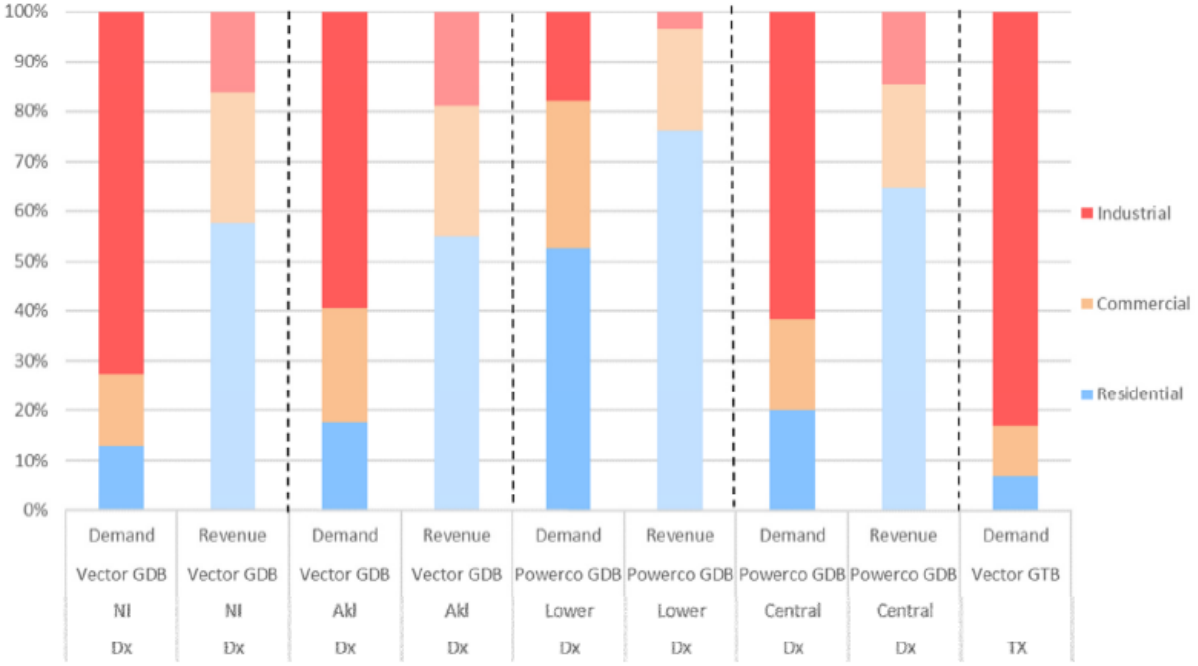
446. Regarding differences in customer mix between electricity and gas, we note that Concept previously submitted evidence of the split between volumes and revenues across New Zealand gas pipelines.[346] Figure 10 below indicates that the majority of gas volumes are consumed by industrial users, the majority of revenues are collected from residential consumers.

344 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.

345 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.

346 Concept Consulting's submission on the gas pipeline stakeholder meeting "Relative long-term demand risk between electricity and gas networks" (report prepared for Powerco, 27 January 2016), p. 8.

Figure 10: Demand and revenue split across consumer segments for gas pipelines



Source: Concept Consulting Group

447. Further, analysis from Houston Kemp (as shown in Table 4 below) indicates that a similar proportion of revenues are from small customers across both gas and electricity distribution networks (62% and 63%, respectively).[347] This is despite only 21% of volumes on gas distribution networks being driven by small customers, compared with 48% for electricity distribution.

Table 4: Comparison of volume weights and revenue weights

	Percent volumes from small customers	Percent revenues from small customers
GasNet	21%	74%
Powerco	33%	71%
Vector	16%	56%
Average gas distribution	**21%**	**62%**
Average electricity distribution	**48%**	**63%**

448. In his review of submissions on the draft decision, Dr Lally noted that he accepts Houston Kemp's submission that their earlier analysis intentionally used data from electricity and gas distribution businesses, rather than the entire electricity and gas sectors. However, in response to Houston Kemp's submission that their analysis

[347] Houston Kemp "Asset beta for gas pipeline businesses" (report prepared for Powerco, May 2016), p. 11.

supports an asset beta differential of at least 0.10, Dr Lally noted that the following contrary considerations exist.[348]

448.1 Income elasticities of demand (adjusted for the proportion of revenues arising from variable charges) are part of a large set of factors that affect the sensitivity of returns on an asset to real GDP shocks, and returns are also influenced by several other shocks. There are no clear grounds to consider that the differences in income elasticities of demand (adjusted for the proportion of revenues arising from variable charges) would induce a beta increment of at least 0.10.

448.2 Price cap regulation (which distribution businesses are subject to) would dilute the effect of a higher income elasticity of demand upon beta, ie, price cap regulation reduces the value of theta and, the shorter the regulatory cycle, the greater the reduction.

448.3 The Commission is required to estimate the betas for gas transmission, electricity transmission, gas distribution and electricity distribution. Houston Kemp's analysis provides beta estimates for only two of the four types of businesses (electricity distribution and gas distribution). A consistent approach would require estimating the income elasticity of demand for the electricity/gas transmission businesses and using this to estimate their beta relative to electricity and gas distribution businesses, however this analysis has not been done.

448.4 The Commission has elected not to apply a beta increment for businesses subject to price cap regulation relative to those subject to revenue cap regulation, despite theoretical grounds for such an increment, because the empirical literature does not provide any clear evidence of a differential. Consistency requires the same approach to the question of a beta differential for gas over electricity businesses.

449. Dr Lally concluded that:[349]

> Collectively, these four points lead me to conclude that a beta uplift of 0.10 for gas over electricity distribution businesses should not be allowed. Furthermore, I consider that 0.10 is the lowest level at which estimation of this parameter is possible.

450. Houston Kemp submitted that the "original rationale for applying an asset beta uplift for GPBs has not significantly changed because the evidence relied upon by Dr Lally in support of the asset beta uplift has not significantly changed".[350]

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348 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 5-7.

349 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 7.

451. In response, Dr Lally noted that "the underlying evidence has changed from a situation in which the gas businesses were not subject to formal control (at which point I favoured the differential of 0.10) to the present situation in which they are subject to formal control". He also noted that "the effect of this change is to weaken the impact of growth options on beta, and also to weaken the impact of the income elasticity of demand upon beta through the periodic resetting of prices to reflect demand shocks".[351]

Conclusion on gas asset beta adjustment

452. On balance, we have decided to make a 0.05 upwards adjustment to the gas asset beta.

453. We consider that none of the reasons for an uplift are very strong in isolation. However, when combined, the higher income elasticity of demand for gas, and relatively low gas penetration in New Zealand support an upwards adjustment to the gas asset beta (but not as high as the 0.10 adjustment we made in 2010). We also consider that the comparator sample results provide some limited support for an upwards adjustment to the gas asset beta. In our judgement, 0.05 is appropriate.

454. In reaching this view, we note that we disagree with Dr Lally's rounding of asset beta to the nearest 0.10. Rounding to the nearest 0.10 could lead to big swings in allowed rate of return, given that a 0.10 change in asset beta leads to approximately a 75 basis point change in the 67th percentile WACC. Our view is that 0.05 is more appropriate.

455. Applying an upwards adjustment of 0.05 to reflect the greater exposure to systematic risk faced by gas pipelines leads to an asset beta for GPBs of 0.40.

456. In the draft decision we noted that, in some circumstances, an upwards adjustment relative to the asset beta for GPBs could suggest a corresponding downwards adjustment should be made to the asset beta for EDBs and Transpower.[352] However, given that our decision to apply a 0.05 uplift for GPBs largely reflects differences between New Zealand GPBs and our sample of international comparator companies, we have not made a downwards adjustment relative to the asset beta for EDBs and Transpower.[353]

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350 Houston Kemp (report prepared for Powerco) submission on IM review draft decisions papers "Issues raised by the Commerce Commission's draft decision on cost of capital" (4 August 2016), p. 19.

351 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 7.

352 This is because we have derived our unadjusted asset beta estimate of 0.35 from a sample of both electricity and gas businesses. Increasing our gas estimate to 0.40 potentially suggests that the electricity estimate should be decreased, to ensure the weighted average remains 0.35.

353 For further discussion see: Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 386-387.

Re-levering the average asset beta into an equity beta

457. For the reasons explained above, we have determined an asset beta of 0.40 for GPBs. Combining this with a notional leverage estimate of 42% (as explained in paragraphs 546 to 572), results in an equity beta of 0.69.[354]

We have determined an asset beta of 0.60 for airports

458. We have determined an asset beta of 0.60 for specified airport services, which is the same as the value we set in 2010. The asset beta of 0.60 reflects updated data for our revised airports comparator sample.

459. In reaching this view we followed the same six-step process used in 2010, as outlined in paragraph 266. This is consistent with the process used for updating our asset beta estimates for EDBs, Transpower, and GPBs, as explained above.

Identifying a sample of relevant comparator firms

460. 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.

461. 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.

462. 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.

463. This resulted in a sample of 26 firms. Further details regarding these 26 companies, including changes from the 2010 comparator sample, company descriptions, and asset beta results, are included in Attachment C.

464. In its submission on the draft decision, NZ Airports stated that "[i]t is appropriate for the Commission to update its asset beta comparator sample, given the passage of time since the 2010 IMs were determined" and "[w]e also agree with the

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354 We have calculated the equity beta using the re-levering formula in paragraph 295.2:
$\beta e = \beta a + (\beta a - \beta d)L/(1-L)$

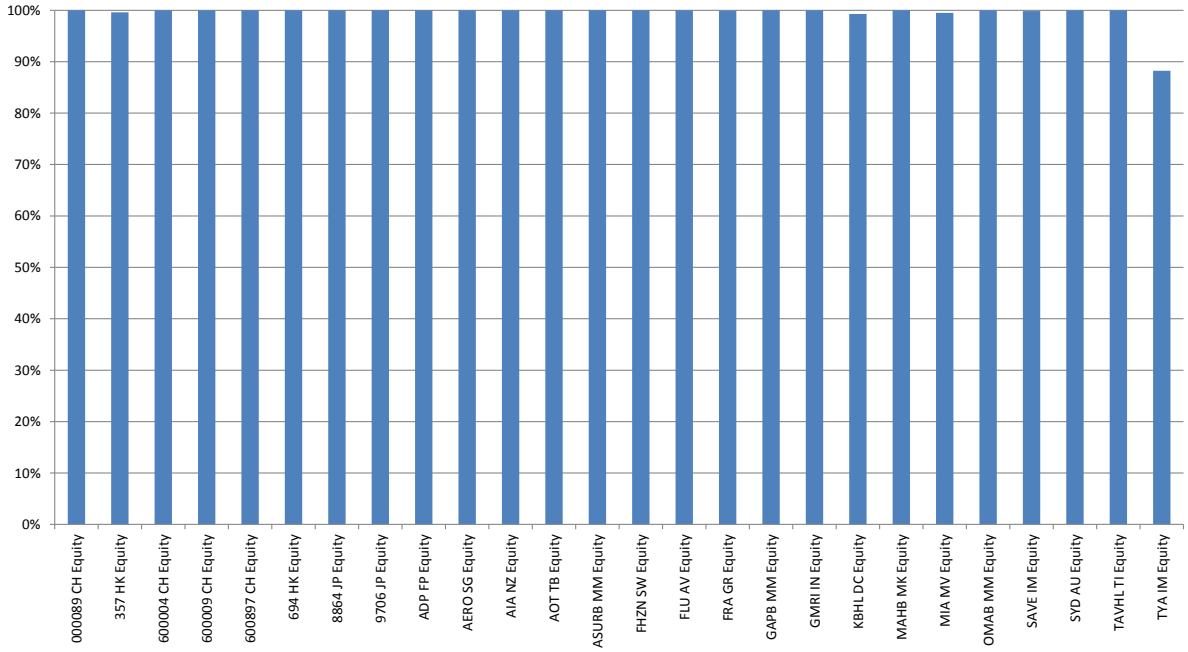
where βa is the asset beta for GPBs of 0.40, βd is the debt beta (which we have assumed to be 0), and L is the average leverage of 42%.

Commission following the same approach to sampling (eg a broad sample set) to the extent possible".[355]

465. We have retained the same comparator sample as the draft decision, given we received no submissions suggesting companies be added or excluded.[356]

466. We also considered applying a percentage of days traded liquidity filter, consistent with our approach to the energy comparator sample.[357] Data on the percentage of days traded for the companies in the airports sample, for the 2011-2016 period, is shown in Figure 11 below.

Figure 11: Percentage of days traded for companies in airports sample (2011-2016)



467. We have not excluded any companies from the airports sample, based on the percentage of days traded. Toscana Aeroporti (TYA IM Equity) had the lowest percentage of days traded over the 2011-2016 period, at 88%. We consider that this is not an obvious outlier which should be removed from the sample (unlike Jersey Electricity in the energy sample, which was only traded on 36% of days over the sample period).[358]

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355 NZ Airports "Submission on Commerce Commission's input methodologies review draft decision" (4 August 2016), para 155.

356 We note that the two Japanese companies in the sample – Airport Facilities and Japan Airport Terminal – are not airport owners, but rather provide services to airports. Although we have retained these companies in the sample, we intend to consider this again in the next IM review. Excluding these two companies would not have affected the sample average asset beta of 0.65.

357 See paragraph 284.1 above.

358 As noted in footnote 178 above, we also considered applying an average bid-ask spread liquidity filter. However, we did not receive any submissions on the appropriate threshold (or any submissions on

Estimating the equity beta for each firm in the sample

468. 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 286 to 291.

469. 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:

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

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

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

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

470. Consistent with the approach to the energy sample, we have corrected several errors in our asset beta spreadsheet since the draft decision.[359]

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

471. 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.

472. 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 5. Further details regarding the results for the comparator sample are included in Attachment C.

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applying liquidity filters to the airports sample more generally). Further: (i) given the small size of the airports sample, we are reluctant to unnecessarily exclude companies, and (ii) even if we did exclude airports with a relatively high average bid-ask spread percentage, the impact on the results would be relatively immaterial.

359 See paragraph 292 for further details.

Table 5: Airport comparator sample asset beta results

	1996-2001	2001-2006	2006-2011	2011-2016
Daily asset beta	0.48	0.66	0.60	0.59
Weekly asset beta	0.18	0.53	0.62	0.62
Four-weekly asset beta	0.24	0.58	0.69	0.66
Average leverage	17%	12%	18%	20%
# of companies with data available	6	19	25	26

473. When determining our asset beta estimate for airports, we have given greater 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 297 to 307. This results in an average asset beta for the airports comparator sample of 0.65.

474. The average asset beta for the airports comparator sample has increased from 0.63 to 0.65 since the draft decision, after correcting errors affecting weekly asset betas (as referred to in paragraph 470 above).

We have made a 0.05 downwards adjustment to the airports sample average

475. We consider that the average asset beta from the comparator sample (0.65) is likely to overstate beta for regulated aeronautical activities, because it relates to airports' overall (multi-divisional) businesses.

476. The average of the comparator sample gives us an asset beta estimate for an airport's total operations, rather than regulated activities only.[360] This raises the question of whether an adjustment is required to generate an asset beta estimate for regulated aeronautical activities.

477. 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.

478. 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), for example there is greater demand uncertainty.

479. In both the draft decision and the 2010 IMs we made a downwards adjustment of 0.05 (from 0.65 to 0.60). We considered the average asset beta for the 2010

[360] 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.

comparator sample (0.65) to be an upper bound, as it included both regulated and unregulated activities.

480. Submissions from NZ Airports, Auckland Airport, and UniServices (for Auckland Airport) argued that the 0.05 downwards adjustment we made in the draft decision is not warranted.[361] For example, in response to the analysis contained in our draft decision, UniServices submitted that:[362]

480.1 it was unable to replicate Figure 8, and its own analysis suggested a weak (not significant) positive relationship between asset beta and the percentage of aeronautical revenue for airports;

480.2 in the absence of a more detailed understanding of how Deutsche Bank estimated parameters such as the asset beta and leverage, any inferences and conclusions from Deutsche Bank's estimates of Auckland Airport's aeronautical asset beta (and any difference between Auckland Airport's overall beta and aeronautical beta) must be treated with caution;

480.3 based upon the assumptions adopted in his paper, Dr Lally should have recommended a base case downward adjustment for the aeronautical assets of airports of less than 0.03;

480.4 if Auckland Airport has a higher than average weighting to non-aeronautical activities in the comparator sample of airports, it would be expected to have an overall asset beta higher than the sample average of 0.63. This suggests that the Commission's calculation of a 0.08 downwards adjustment using value weightings is overstated;

480.5 the PwC report on Queenstown Airport recommended an asset beta of 0.60 for the aeronautical business, which was only 0.03 less than the asset beta of 0.63 in the draft IM review decision; and

480.6 if the Commission decides to make a downwards adjustment to its industry-wide asset beta for airports, any such downward adjustment to the asset beta should be no greater than 0.03.

[361] NZ Airports "Submission on Commerce Commission's input methodologies review draft decision" (4 August 2016), para 157-168; and Auckland Airport "Input methodologies review: Cross submission on draft decision – Cost of capital parameters" (25 August 2016), para 9-13.

[362] Auckland UniServices Ltd (report prepared for Auckland Airport "Input methodologies review draft decisions – Asset beta and TAMRP for airports." (25 August 2016), p. 5-6.

481. Covec (for BARNZ), on the other hand, submitted that "there are sound reasons to expect the asset beta of an airport to decrease with the proportion of its revenues that are aeronautical", noting that:[363]

481.1 it is generally true that regulated firms have more stable earnings than unregulated firms, referring to a 1992 paper from Riddick;

481.2 in the case of a dual till regulated airport, it would be reasonable to expect that consumer decisions over retail spending on food and clothing inside an airport would be more discretionary than choices over whether or not to travel;

481.3 airports are well placed to test these arguments empirically, since they hold information on the volatility of demand by for passenger travel and retail spending as it affects their own business; and

481.4 such evidence would be rather more compelling than debates over the interpretation of benchmarking sample, but in the absence of such evidence it is difficult to see a reason to change the Commission's existing practice.

482. We agree with NZ Airports and UniServices that there was an error in Figure 8 of the draft decision, and that when corrected, the revised graph does not support making a downwards adjustment to the sample average. In his review of submissions, Dr Lally noted that "…the most important point here is that the estimated relationship between asset beta and aeronautical revenue is not statistically significant", and that "regardless of whether the Commission has erred over data, this evidence does not warrant any material weight in either direction".[364]

483. However, we consider that other factors support maintaining the 0.05 adjustment applied in both the 2010 IMs and our draft decision. In particular:

483.1 Auckland Airport has previously acknowledged that its unregulated services would be expected to have a higher WACC than its regulated aeronautical services. This suggests a downwards adjustment should be made to the comparator sample average.[365]

483.2 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').[366] De-levering using the "standard textbook" formula (as

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363 Covec (report prepared for BARNZ) "Economic commentary on airport WACC submissions" (18 August 2016), para 43-46.

364 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 10.

365 Auckland International Airport Limited "Airport regulation and pricing - Issues Brief" (November 2006), p. 5.

366 Deutsche Bank "Auckland Int. Airport – Excellent 1H16, regulatory red light" (19 February 2016), p. 13.

suggested by UniServices) rather than the Brennan-Lally formula, and assuming 35% leverage, leads to an asset beta of 0.51 for AIAL's regulated business, which is still 0.05 lower than the asset beta for AIA Group (0.56).[367]

483.3 PwC uses an asset beta of 0.60 for Queenstown Airport's aeronautical business, and 0.60-0.80 for its commercial activities.[368] PwC also estimates the value weight on unregulated activities at 53-55%. Using mid-point values suggests an average asset beta for all of Queenstown Airport's activities of 0.65 (ie 0.05 downwards adjustment).[369]

483.4 The CAA estimated asset betas of 0.50 and 0.56 for Heathrow and Gatwick, significantly below our sample average of 0.65.[370]

483.5 We used an asset beta of 0.50 for the 2002 Airports Inquiry, based on advice from Dr Lally.[371]

484. After reviewing the UniServices submission, Dr Lally considered that across the five points discussed "…four support the Commission's position whilst the fifth is essentially neutral". However, he concluded that "the Commission's proposed deduction of 0.05 is below the minimum deduction of 0.10 that I would apply to beta issues" and therefore "…my view is that the deduction (if one is to be made) should be 0.10 or some multiple of it".[372]

485. We disagree with Dr Lally's approach of rounding asset beta to the nearest 0.10, for the reasons discussed in paragraph 454 above. On balance, we consider that the available evidence supports a downwards adjustment to the airports asset beta of 0.05, but there is limited evidence to support a 0.10 adjustment.

486. For the above reasons, we consider that a 0.05 downwards adjustment from the sample average is appropriate. Applying the 0.05 adjustment leads to an asset beta for specified airports services of 0.60, consistent with the 2010 IMs.

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367 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 10.

368 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.

369 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 10-12.

370 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, para 6.53.

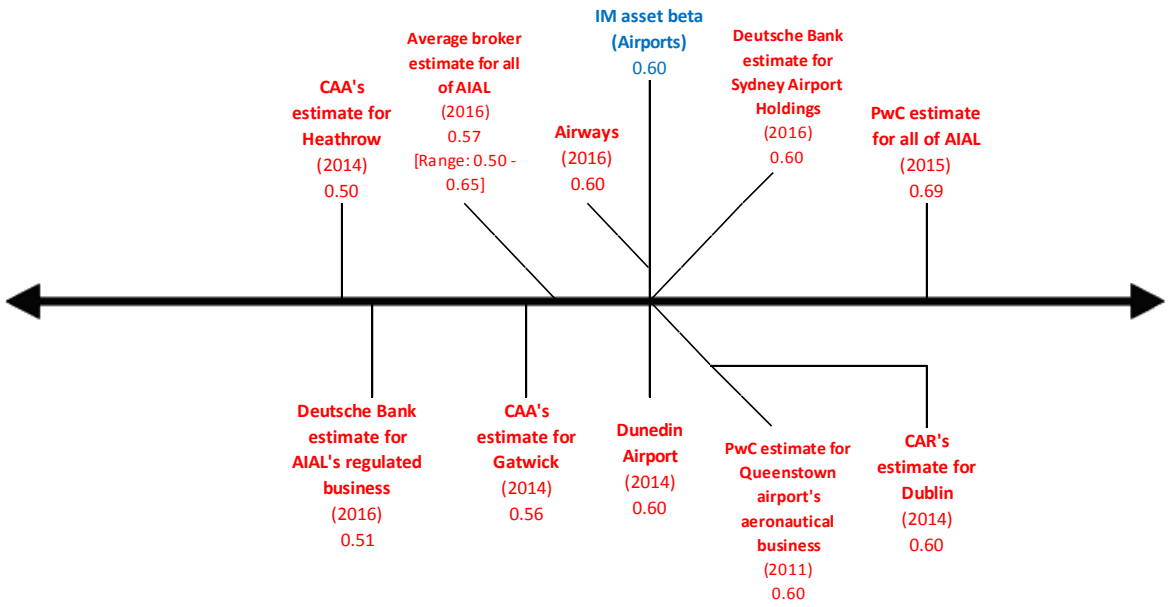
371 Commerce Commission "Final Report Part IV Inquiry into Airfield Activities at Auckland, Wellington, and Christchurch International Airports" (1 August 2002); Martin Lally "The cost of capital for the airfield activities of New Zealand's international airports" (November 2001).

372 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 12.

Reasonableness of our asset beta estimate for airports of 0.60

487. We have assessed the reasonableness of our asset beta estimate of 0.60 based on available comparative information, as shown in Figure 12.[373]

Figure 12: Reasonableness checks on our asset beta estimate for airports



488. The above diagram shows that our asset beta estimate for airport services of 0.60 falls within the range of comparable information. We consider that this supports the reasonableness of our estimate.

Re-levering the average asset beta into an equity beta

489. For the reasons explained above, we have determined an asset beta of 0.60 for specified airport services. Combining this with a notional leverage estimate of 19% (as explained in paragraphs 546 to 572), results in an equity beta of 0.74.[374]

Tax adjusted market risk premium

490. We have maintained a TAMRP of 7%, which is the estimate used in the previous IMs.[375] The TAMRP is a market-wide parameter, so we use a consistent approach across sectors.[376]

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373 Since the draft decision, we have changed the Deutsche Bank estimate for AIAL's regulated business from 0.46 to 0.51 in response to UniServices' submission. Auckland UniServices Ltd (report prepared for Auckland Airport "Input methodologies review draft decisions – Asset beta and TAMRP for airports." (25 August 2016), p. 11-14.

374 We have calculated the equity beta using the re-levering formula in paragraph 295.2:
$\beta e = \beta a + (\beta a - \beta d)L/(1-L)$

Where βa is the asset beta for airports of 0.60, βd is the debt beta (which we have assumed to be 0), and L is the average leverage of 19%.

491. After reviewing submissions on the estimators that we use for the TAMRP (detailed in paragraphs 501 to 528), we continue to consider that the evidence from these estimators, suggests that 7% remains an appropriate estimate of the TAMRP for the IMs.

492. 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).

493. 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:

    493.1 studies of historic returns on shares relative to the risk-free rate;

    493.2 surveys of investors that ask them to state their expected rate of return for the overall market; and

    493.3 empirical estimates of the MRP from share prices and expected dividends.

494. In the previous IMs we estimated a TAMRP of 7% by considering a range of information sources, including both forecast and historic estimates of the TAMRP.[377] We noted that a TAMRP of 7%:

    494.1 best reflected the range of evidence available, including both historical returns and expected future returns;

    494.2 was considered reasonable by the Cost of Capital Expert Panel (which included Dr Lally); and

    494.3 was consistent with the range of TAMRP estimates used by New Zealand market participants, including New Zealand investment banks.

495. We recently considered the TAMRP as part of our pricing determination for two regulated telecommunications services – Chorus' UCLL and UBA services.[378] In those determinations we also used a TAMRP of 7%, after considering updated analysis

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375 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), para 6.5.18.

376 As noted in paragraph 495, we most recently considered the TAMRP as part of our pricing determination for two telecommunications services.

377 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), para 6.5.4-6.5.15.

378 Commerce Commission "Cost of capital for the UCLL and UBA pricing reviews – Final decision" (15 December 2015), p. 41-47.

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 6.[379]

Table 6: 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%

496. 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 was our most recent decision on how the TAMRP should be estimated.[380]

497. In particular, CEG (for the ENA) submitted that:[381]

497.1 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;

497.2 Dr Lally has introduced three new methods to estimate the New Zealand MRP (Siegel version 1, Siegel version 2, and surveys);

497.3 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

497.4 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.

379 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.

380 Commerce Commission "Input methodologies review – Update paper on the cost of capital topic" (30 November 2015), para 2.23-2.27.

381 CEG "Key reforms to rate of return under the IMs" (report prepared for ENA, February 2016), p. 22-43.

498. Frontier Economics (for Transpower) submitted that:[382]

498.1 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;

498.2 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%;

498.3 different weight should be placed on different methods of estimating the TAMRP, based on their relative strengths and prevailing market conditions (in particular, the Siegel version 1 method should be discarded, and minimal weighting placed on survey evidence); and

498.4 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).

499. Dr Lally considered these submissions in his report and continued to recommend a TAMRP of 7%. He stated that:[383]

> …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.

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

383 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.

500. Dr Lally also made the following points in response to the submissions from CEG and Frontier Economics.[384]

500.1 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.

500.2 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.

500.3 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.

500.4 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 from 6.9% in 2014 to 7.1% in 2015. However, the rounding process leaves the estimate unchanged at 7.0%.

500.5 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.

500.6 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).[385] When advising us on TAMRP he has consistently used the results of surveys since 2001, and Siegel version 1 since 2003.

500.7 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

[384] 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).

[385] Dr Martin Lally "Review of the AER's Methodology for the Risk-Free Rate and the Market Risk Premium" (4 March 2013).

of imputation credits in its DGM estimate was incorrect, and Dr Lally mistakenly overlooked this error when including it in his 2014 report.[386]

500.8 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".[387]

Submissions on our draft decision

501. The two main submissions on our draft TAMRP decision were that of Frontier (on behalf of Transpower) and UniServices (on behalf of AIAL). Frontier's comments focussed on the weighting of historical and forward-looking data in our estimate, with a preference for estimators that use forward-looking data. UniServices focussed more specifically on the calculations within the estimators.

502. Frontier restated its view that the estimators we use for the TAMRP, and the equal weightings that we apply, will consistently produce the same result. It continues to consider that this is problematic because the TAMRP should vary with financial market conditions.[388]

503. Frontier's submission went on to propose different weightings that we should apply to each of our estimators to obtain a more accurate estimate of the TAMRP. It suggests that we should continue to give equal weighting to New Zealand and international data.[389]

504. We do this by taking the average of the median New Zealand result of the five estimators and the median international result. UniServices appeared to agree with our weighting of New Zealand and international data, because it applied the same weighting to its own results.[390]

505. For the same reasons as in its previous submissions on our cost of capital update paper, Frontier continues to suggest that we should give no weighting to either the survey estimator or the Siegel 1 estimator. As a result Frontier proposed that we give equal weighting to the Ibbotson and Siegel 1 estimators, and then double weighting

386 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.

387 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. 58.

388 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 36.

389 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 37.

390 Auckland UniServices Ltd (report prepared for Auckland Airport "Input methodologies review draft decisions – Asset beta and TAMRP for airports." (25 August 2016), p. 28.

to the DGM estimator.[391] Frontier noted that if we adopted these weightings, we would arrive at a TAMRP estimate of 7.8%.[392]

506. In Dr Lally's latest report, in which he responds to submissions we received on our draft TAMRP decision, he refers to his previous comments regarding Frontier's suggestion to give no weight to the survey estimator.[393] Dr Lally has previously asserted that Frontier's suggestion to give no weight to the survey estimator is:[394]

> purely on the basis that they have moved slowly in recent years rather than because they are bound to do so, which is not the case. So, Frontier are essentially criticising an estimator (surveys) on the basis of its outcome rather than its inherent properties,

507. We have not received new arguments or evidence as to why we should give no weighting to the survey estimator. Our view remains that it provides a useful data point among a series of imperfect estimators and we have continued to give its results equal weighting.

508. Frontier's submission on our draft TAMRP decision reiterated its view that we should not use the Siegel 1 estimator when estimating the TAMRP. This view is, in part, because it considers that it is "not appropriate to consider the Ibbotson and Siegel 1 approaches to be separate techniques".[395] It, therefore, considers that we are putting too much weight on historical average excess returns. Dr Lally has previously responded to this view, noting that:[396]

> Despite this significant commonality in data, they each have produced significantly different estimates of the TAMRP. There are only two completely distinct estimators: Ibbotson and the DGM. Thus, if one seeks a larger set of estimators, which is desirable in my view, the rest will have to be variants of one or both of the Ibbotson and DGM estimators.

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391 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 37-38.

392 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 39.

393 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 15.

394 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. 65.

395 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 38.

396 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. 66.

509. Frontier's appendix to its submission responded to Dr Lally's previous advice on why we should continue to use the Siegel 1 estimator. Frontier focussed on three main points:

509.1 "there is no longer any reason to think that real yields on government bonds over most of the 20th century were 'too low' and require any form of upward adjustment";[397]

509.2 there are explanations other than pronounced unanticipated inflation for the low level of real bond yields between 1926 and 1990, and ignoring these factors "distorts the picture of the full range of market conditions that investors can expect to face over the long-run";[398] and

509.3 the 'bias' in the Ibbotson estimate cannot be reliably corrected, and it does not need to be corrected because a historical estimator "must reflect a full range of market conditions that investors can expect to face over the long-run".[399]

510. In his latest advice, Dr Lally responds to these points from Frontier. He notes that he "never asserted that the low real bond yields in the late 20th century were due exclusively to unanticipated inflation".[400] However, he argues that some of Frontier's alternative explanations could have only added to the unanticipated inflation's negative yields on bonds, rather than caused the effect. He also considers that some of Frontier's other explanations for the effect were only temporary and, therefore, support a downwards adjustment to the Ibbotson estimator.[401]

511. Dr Lally also reinforces his previous assessment of why a downward adjustment to the Ibbotson estimator should be made, notably that:[402]

> the impact of unanticipated inflation is one of a large set of phenomena giving rise to overestimation of the MRP from the Ibbotson methodology, no phenomena operating in the opposite direction are apparent, the downward adjustment to the Ibbotson MRP to reflect only unanticipated inflation is the only one of these phenomena that can be estimated to an acceptable degree of precision, and this supports the case for doing so.

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397 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 57.

398 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 58-59.

399 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 60-63.

400 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 19.

401 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 19-20.

402 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 20.

512. In response to Frontier's argument that the bias in the Ibbotson estimate cannot be reliably corrected, Dr Lally notes that using any point in the range of estimates for the expected real yield on nominal government bonds would cause the Siegel 1 estimator to produce estimates of 5.9% to 6.8%, which would not affect the median estimate of all the TAMRP estimators. As such, Dr Lally does not recommend removing the Siegel 1 estimator from our range of evidence.[403]

513. We consider that our approach gives us the best estimate of the TAMRP. We note that all of the estimators that we use have flaws, as mentioned above, but we are aware of criticisms that could result in higher, or lower, TAMRP estimates not all of which have attracted submissions. For example, the DGM estimator is sensitive to the view taken on long-term real GDP growth.

514. However, we are not convinced by evidence that suggests that we should remove some estimators, or add weight to others. We continue to agree with Dr Lally that giving an equal weighting to the five imperfect estimators that we use gives us the best estimate of the TAMRP for this IM review.

515. UniServices' submission provided an adjusted estimate of the TAMRP which gave equal weighting to each of the five estimators. However, UniServices did propose some amendments to these estimates. UniServices concluded that, based on its recommended changes to the estimators, an appropriate estimate of the TAMRP would be 7.25%.[404]

516. UniServices disagreed with Dr Lally's method for adjusting the survey results using the risk-free rate. Uniservices suggested that the adjustment "should be estimated based on a risk-free rate at the time the survey was undertaken", rather than the time that the TAMRP was estimated.[405]

517. Dr Lally does not disagree with UniServices' proposed amendment to the survey estimator. However, he notes that the results are "inconsequential" and does not recommend that we make the change.[406]

518. UniServices' proposed amendment to the survey estimator adjustment would result in a New Zealand estimate of 6.9% instead of 6.8% and an international estimate of 6.5% instead of 6.3%. We, therefore, agree with Dr Lally that these changes are not material and note that they would have no effect on the median result of our TAMRP estimators.

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403 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 21.

404 Auckland UniServices Ltd (report prepared for Auckland Airport "Input methodologies review draft decisions – Asset beta and TAMRP for airports." (25 August 2016), p. 28.

405 Auckland UniServices Ltd (report prepared for Auckland Airport "Input methodologies review draft decisions – Asset beta and TAMRP for airports." (25 August 2016), p. 27.

406 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 15.

519. UniServices also proposed an amendment to the Siegel 1 and Ibbotson international estimate. It suggested that a more appropriate adjustment to the international version would be to:[407]

519.1 start with the Ibbotson (foreign) measure of the TAMRP (as per our adjusted estimate);

519.2 add back the historical average real yield on NZ bonds (net of the tax effect); and

519.3 deduct a proxy for the historical average of the market's expected real yield on NZ bonds (net of the tax effect).

520. Dr Lally responds to these points in his latest advice and generally does not agree with UniServices' approach because there is a "lack of data on the tax regimes and parameters applicable in each of those countries over the relevant historical period (since 1990)."[408]

521. Dr Lally acknowledges that UniServices' suggestion has its merits, but does not consider that historical New Zealand data is the best available proxy because the "tax regime in New Zealand over this period (1931-2014) is likely to have been quite different to most of these other countries".[409] He considers that other countries may not have operated dividend imputation, for example, which suggests that UniServices' adjustment is not warranted. Ultimately, Dr Lally concedes that neither his nor UniServices' approach to the Ibbotson and Siegel 1 international adjustments are perfect, but he maintains a preference for his approach. Dr Lally also examined the impact on the adjustment of a tax regime with no imputation and dividends and interest fully taxable over the historic period. Under this assumption, the result is closer to the original calculation.

522. The submission highlights a data difficulty with these estimates. There is a lack of data on the tax regimes and parameters in each of the countries as noted by Dr Lally. We do not consider the adjustment submitted by UniServices will add to the accuracy of the estimate.

523. PwC (on behalf of 17 EDBs) also suggested more precise rounding, submitting that "the estimates are sufficiently robust that the mean values can be rounded to the nearest 0.1%."[410] Frontier have expressed concern about the use of median values

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407 Auckland UniServices Ltd (report prepared for Auckland Airport "Input methodologies review draft decisions – Asset beta and TAMRP for airports." (25 August 2016), p. 24.

408 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 13.

409 Dr Lally's expert advice "Review of further WACC submissions" (report to the Commerce Commission, 23 November 2016), p. 14.

410 PwC "Submission to the Commerce Commission on input methodologies review: Draft decisions papers" (4 August 2016), para 250.

and rounding as forcing rigidity into the TAMRP estimates and has pointed to the monetary impact of this rounding on customers and suppliers.[411] UniServices submitted that we should move to rounding to the nearest 0.25%.[412]

524. We have previously accepted Dr Lally's recommendation to round our TAMRP estimate to the nearest 0.5% because it avoids the need (and the cost) of estimating the TAMRP to a very high degree of precision, which is desirable because high levels of precision in this area are spurious.

525. The estimation of TAMRP is inherently uncertain and we continue to agree with the views expressed about rounding by Dr Lally, in particular where rounding has little impact on the standard error of the estimate.[413] We note moving to rounding to 0.25% would not change our estimate of the TAMRP.

526. 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.

527. To support our draft decision, we considered it was important to review alternative evidence as a cross-check. Based on discussions with analysts at the time, we understood that a TAMRP of 7% is generally consistent with estimates used by New Zealand investment banks. Table 7 summarises recent TAMRP estimates from investment banks, which range from 6.5% to 8%.

Table 7: 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%

411 Frontier Economics "Cost of equity issues related to Input Methodologies Review" (February 2016), p. 15-16

412 UniServices, "Input Methodologies Review Draft Decisions – Asset Beta and TAMRP for Airports" (25 August 2016), p. 28.

413 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. 66.

528. Frontier criticised our use of this evidence:[414]

> the Commission would need to undertake much more comprehensive and complete analysis of New Zealand investment banks' estimates of the cost of capital before concluding that 7.0% is consistent with those banks' actual view of the TAMRP.

529. We agree that this evidence may have limitations, but still consider that it acts as a useful cross-check and is the best evidence before us we can use as a cross-check.

530. We have continued to use a TAMRP estimate of 7.0% for the reasons listed below.

530.1 Given that the various approaches to estimating TAMRP produce significantly different estimates, 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.

530.2 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).

530.3 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.

530.4 We understand that an estimate of TAMRP of 7.0% remains generally consistent with the estimates used by New Zealand investment banks, as noted in paragraph 527 above.

531. We note that our estimate of the TAMRP over time has been very stable. This would also appear to be consistent with the estimates from New Zealand investment banks. In 2010 we conducted a similar survey of investment banks and, in general, the estimates were the same as those in Table 7 above.[415]

532. However, our estimate of the TAMRP is not immovable over time and we have previously increased it when there was evidence that the TAMRP had changed.

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414 Frontier Economics (report prepared for Transpower) "Response to cost of capital issues raised in draft input methodologies" (4 August 2016), p. 42.

415 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), Table H11, p. 492.

For example, in 2010 we increased our estimate to 7.5%, due to the impact of the GFC on the premium for owning risky assets.[416]

533. As discussed in Chapter 7, we have conducted reasonableness checks to assess whether, based on the decisions set out in this paper (including our TAMRP estimate), our estimates are reasonable compared to other WACC estimates. We conclude that our WACC estimates are reasonable based on the comparative information we have assessed.

Risk-free rate

534. Consistent with the 2010 cost of capital IMs, we have decided to apply the same approach to estimating the risk-free rate for the cost of equity as that applied in the cost of debt. As noted in paragraph 78.1, we have decided to maintain the current prevailing approach to estimating the risk-free rate, but extend the determination window from one month to three months.

535. Wellington Electricity submitted that "there is a strong case for extending the risk-free rate from five years to 10 years when determining the cost of equity as it better aligns with expert valuation practices and the long lived nature of EDB investments".[417]

536. We disagree, and have adopted a five-year term of the risk-free rate for both the cost of equity that was used, and for the cost of debt. This ensures consistency in estimating the cost of equity and the cost of debt. It also ensures the overall cost of capital is estimated on a basis consistent with the regulatory period to which it will be applied. We also note that:

    536.1 Estimates of the risk-free rate used for expert valuations are used in a different context to regulatory WACC estimates, where prices are reset every five years. We have previously explained the reasons why the term of the risk-free rate should match the term of the regulatory period.[418] In the IMs merits appeals judgment, the High Court agreed with the principle that "…the term of the risk-free rate should be aligned to the regulatory term to avoid over and under compensation".[419]

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416 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), p. 477.

417 Wellington Electricity "Input methodologies review: Response to draft decisions" (4 August 2016), p. 7. Wellington Electricity also submitted that we should consider adopting a one year averaging period when determining the risk-free rate for the cost of equity. Our reasons for using a three month averaging period when estimating the risk-free rate are explained in Chapter 3.

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

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

536.2 A number of suppliers, with the power to set prices as they see fit and which set their own cost of capital when pricing their services, adopt a term of the risk-free rate of five years (the same as the pricing period).[420]

Equity issuance costs

537. Wellington Electricity submitted that the cost of capital IMs should include an allowance for equity raising costs, consistent with the approach taken by the AER. Wellington Electricity stated:[421]

> Equity raising costs are paid by an entity when it raises equity from new or existing shareholders. These costs include legal and investment banking fees (e.g. brokerage, due diligence and underwriting fees). New equity is needed to maintain a given capital structure (in the case of benchmark operator, a 44 per cent gearing ratio) and credit rating (BBB+). Equity raisings are especially required when capital expenditure grows faster than revenues.
> ...
> WELL recommends the Commission consider the AER's methodology for estimating equity raising costs, and provide an allowance for these efficiently incurred costs.

538. The ENA's cross submission supported including an allowance for equity issuance costs.[422]

539. We disagree with these submissions, and consider that an allowance for equity issuance costs is not required. We note that:

539.1 Equity capital is normally available into perpetuity and does not need regular refinancing.[423]

539.2 Each company chooses what proportion of its profits it will retain in the businesses. Retaining profits can be used to finance growth in the asset base without incurring issuance costs.

539.3 In general, given the characteristics of New Zealand EDBs, their ownership, and their capacity to contribute additional equity, there is no evidence of a material issue regarding equity raising costs.

540. Consequently, we have not included an equity issuance cost allowance as part of the cost of capital IMs.

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

421 Wellington Electricity "Input methodologies review: Response to draft decisions" (4 August 2016), p. 7-8.

422 ENA "Input methodologies review draft decisions – Cross submission on cost of capital" (25 August 2016), para 57; and Vector "Vector cross submission on the weighted average cost of capital IM" (25 August 2016), para 14.

423 In contrast, debt capital normally has a finite period to maturity, so debt capital needs to be re-financed regularly.

541. We also note that the AER does not include an allowance for equity raising costs in the WACC, but rather in the capex forecast. In a recent determination for the Jemena distribution network, the AER noted that "we include equity raising costs in the capex forecast because these costs are only incurred once and would be associated with funding the particular capital investments".[424]

[424] AER "FINAL DECISION Jemena distribution determination 2016 to 2020: Attachment 3 – Rate of return" (May 2016), p. 3-367.

Chapter 5: Other WACC parameters

Purpose of this chapter

542. This chapter discusses our findings for the parameters that do not comfortably sit in either the cost of debt or cost of equity chapters.

Structure of this chapter

543. This chapter begins by explaining why we have maintained our current approach to estimating a notional leverage, which includes a discussion of the leverage anomaly associated with the use of the SBL-CAPM.

544. We then discuss the tax rates we have used in our WACC estimates.

545. Finally, we discuss our approach to determining updated estimates of the standard error of the WACC.

Leverage

546. We have maintained our 2010 approach to estimating notional leverage, which is to use the average leverage of our asset beta comparator samples. This results in updated leverage of 42% for EDBs, Transpower and GPBs, and 19% for airports.[425] In comparison, in the 2010 IMs we determined notional leverage of 44% for EDBs, Transpower and GPBs, and 17% for airports.

547. 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.

We address the leverage anomaly by using the average leverage of the asset beta comparator samples

548. 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.

549. 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.[426] This is because interest costs are tax deductible to the firm, but dividends are not.

[425] The average leverage for EDBs, Transpower and GPBs has increased from 41% to 42% since the draft decision. This reflects the refinements to the comparator sample described in Chapter 4.

[426] This is the context normally set out in textbooks when discussing the use of the classical CAPM to estimate the cost of equity.

550. 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.

551. However, a well-known 'leverage anomaly' exists when using the simplified Brennan-Lally CAPM.[427] When the simplified Brennan-Lally CAPM is used to estimate the cost 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.

552. 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.

553. 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.[428] 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.

554. 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:[429]

> 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.

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427 For further discussion see: Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) Reasons paper" (December 2010), para 6.6.1-6.6.16, and Appendix H3.

428 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), para H3.20-H3.64.

429 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: PwC "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: PwC "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.

555. 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 the debt beta.

556. 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 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.

557. 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.[430]

558. 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:[431]

    558.1 Transpower's average forward-looking actual leverage for the value of leverage without further adjustments to the cost of capital IM; or

    558.2 Transpower's average forward-looking actual leverage for the regulatory period for the value of leverage together with a non-zero debt beta; or

    558.3 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.

559. We did not agree with Transpower's submission for a 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 beta), and this may have biased the resulting estimate of WACC (unless a debt beta was incorporated).[432]

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430 Non-zero debt betas are discussed in more detail in paragraphs 383 to 387 above.

431 Transpower "Submission on Leverage Value in the Cost of Capital Input Methodology for Transpower" (2012).

432 Commerce Commission "Input Methodologies (Transpower) Supplementary Reasons Paper for Leverage in Cost of Capital" (29 June 2012), para 1.1.7-1.1.18.

560. The High Court's merits appeals judgment dismissed the challenges 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."[433]

561. The High Court also noted that Auckland Airport 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."[434]

562. 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 comparator samples, the resulting WACC will be the same for those services regardless of the value assumed for the debt beta.

563. In its cross submission, CEG stated that our "standard approach of calculating asset betas assuming zero debt premium [*sic*] and re-levering to the sample average gearing ensures that most of the errors associated with assuming a zero debt beta cancel out in the de-levering and re-levering process". CEG also noted that:[435]

> This approach would be perfect (the errors would cancel out perfectly) if all firms had the same debt beta. However, if debt betas increase with gearing, as they must, then the underestimate of asset beta in the de-levering process will be less than fully cancelled out by a re-levering of asset beta to the sample average gearing.
> …
> We estimate, based on the Commission's sample and our assumptions about debt beta, that that this source of bias causes the re-levered equity beta to be underestimated by around 0.02. Once more, this is a relatively small effect.

564. We consider that our assumption of zero debt beta does not lead to any material bias in our re-levered equity beta estimate. In particular, we note that when a more realistic debt beta assumption than CEG's is used, there is no clear bias demonstrated in our re-levered equity beta estimate of 0.60 for EDBs and Transpower.[436]

    564.1 We have replicated CEG's analysis by de-levering each individual firm's equity beta using Oxera's assumption that debt beta is 0 at 0% leverage, and increases linearly to 0.20 at 90% leverage. As noted in paragraph 387 above,

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433 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, p. 540.

434 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, p. 541.

435 CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Asset betas for gas versus electricity businesses in the Commission's sample" (25 August 2016), para 100-104.

436 As noted in paragraph 387 above, although we consider that Oxera's approach to debt beta is more realistic than CEG's, it still leads to relatively high debt betas, and the assumption of a linear relationship between debt beta and leverage is unlikely to be observed in practice.

although we consider that Oxera's approach to debt beta is more realistic than CEG's, it still leads to relatively high debt betas (and the assumption of a linear relationship between debt beta and leverage is unlikely to be observed in practice).[437]

564.2 Using Oxera's debt beta assumption (and averaging across weekly and four-weekly estimates for 2006-2011 and 2011-2016) leads to an average asset beta for the energy sample of 0.39, an average debt beta of 0.09, and average leverage of 42%. This leads to a re-levered equity beta of 0.60.[438]

Submissions have not changed our view that leverage should be updated

565. Submissions from the ENA, Powerco, and Wellington Electricity did not support updating our leverage estimate. For example, the ENA submitted that leverage should be left at 44% because:[439]

565.1 "the gearing is not very different to 44% and therefore leaving it at 44% is consistent with the Commission's own approach to estimating beta";[440] and

565.2 "the use of average gearing across a sample is only appropriate if debt beta is zero which, in the Commission's sample, is unlikely to be true".

566. Similarly, Powerco submitted that it was "disappointed with the Commission's proposal to revisit the notional leverage", noting that:[441]

566.1 its understanding was that we would not revisit elements of the IMs without clear evidence that the current settings were failing to achieve the legislative purpose (ie, the Commission would refrain from 'tinkering' and that suppliers were invited to exercise similar restraint);

566.2 refreshing the estimate gives a false sense of precision given the acknowledged flaws in the methodology for estimating WACC; and

566.3 the Commission did not adequately signal this change.

567. Methanex and Contact, on the other hand, supported updating notional leverage to reflect the revised asset beta comparator sample analysis.[442]

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437 CEG assumed that for each individual firm, its debt beta is zero if the gearing is less than 30%, and increases with gearing above 30% to a maximum of 0.3.

438 $\beta e = \beta a + (\beta a - \beta d)L/(1-L) = 0.39 + (0.39-0.09) \times 0.42/(1-0.42) = 0.60$.

439 ENA "Input methodologies review – Topic paper 4 cost of capital issues – Submission to the Commerce Commission" (4 August 2016), para 95.

440 Wellington Electricity also submitted that we should "leave the gearing level unchanged, as this is consistent with the approach the Commission applied in determining the values of asset beta and TAMRP". Wellington Electricity "Input methodologies review: Response to draft decisions" (4 August 2016), p. 7.

441 Powerco "Submission on input methodologies review – Draft decisions" (4 August 2016), para 331-333.

568. We disagree with the submissions which argued that leverage should not be updated, for the reasons set out below.

568.1 Updating leverage to reflect updated comparator sample data is consistent with our approach to updating asset beta (contrary to the submissions from Powerco and Wellington Electricity). Both the draft decision and this final decision calculated revised asset beta and leverage values using the updated comparator sample data. However, in the case of the draft decision, the updated asset beta of 0.34 happened to match the value determined in 2010.

568.2 It is important that both asset beta and leverage are set using data from the same comparator sample, across the same time periods, given our approach to addressing the leverage anomaly (as discussed in paragraphs 548 to 564 above). We disagree with Powerco's view that updating leverage is 'tinkering' – we consider that updating leverage to be consistent with our revised asset beta comparator sample is a necessary consequential change (in light of our treatment of the leverage anomaly).

568.3 We disagree with the ENA's statement that "the use of average gearing across a sample is only appropriate if debt beta is zero which, in the Commission's sample, is unlikely to be true". As noted in paragraph 563 to 564 above, our analysis results in the same re-levered equity beta regardless of whether a zero or non-zero debt beta is assumed.

568.4 We signalled in the November 2015 cost of capital update paper that we intended to "use a similar approach as undertaken in 2010 to estimate the other parameters for the cost of capital" and that this included "obtaining a notional leverage from an average of the comparator sample used to determine asset beta".[443] Earlier in that paper we also noted that we intended to re-estimate asset beta values "using updated data and re-assessing the comparator companies".[444]

569. Auckland Airport submitted that data for the airports comparator sample suggests that companies with a lower asset beta typically have a higher leverage. Therefore, Auckland Airport stated that "if the Commission continues to reduce the asset beta estimate from its comparator sample to estimate the asset beta of aeronautical

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442 Methanex "Input methodologies review and Gas DPP consultation" (4 August 2016), p. 4; and Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 26.

443 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), para 2.45.

444 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), para 2.9.

services, it should make a corresponding upwards adjustment to the leverage estimate from its comparator sample".[445]

570. We disagree that an upwards adjustment should be made to the sample average leverage for airports of 19%. In response to Auckland Airport's submission we note that:

570.1 It is not clear that the regulated airport services would support higher leverage than unregulated activities, as implied by Auckland Airport's submission. The High Court dismissed a similar argument from Auckland Airport in the 2013 IMs judgment noting that there was "no evidence on the record that regulated airport services would likely attract higher leverage than unregulated airport activities".[446]

570.2 Assuming a higher leverage estimate (ie higher than average leverage of the comparator firms) when re-levering than that used in de-levering would bias upwards the resulting estimate of WACC, under the simplified Brennan-Lally CAPM (when debt betas are not used).

570.3 It is not clear what Auckland Airport considers an appropriate alternative to 19% would be, given that it has not suggested a specific adjustment to leverage for airports.

Updated leverage for comparator samples

571. Leverage figures for our asset beta comparator samples are included below. Table 8 shows leverage figures for the EDB, Transpower and GPB comparator sample, and Table 9 shows leverage figures for the airports comparator sample.

Table 8: EDB, GPB and Transpower comparator sample average leverage results

	1996-2001	2001-2006	2006-2011	2011-2016
Number of firms in the sample	61	67	70	72
Average leverage	41%	46%	43%	41%

Table 9: Airport comparator sample average leverage results

	1996-2001	2001-2006	2006-2011	2011-2016
Number of firms in the sample	6	19	25	26
Average leverage	17%	12%	18%	20%

445 Auckland Airport "Input Methodologies Review: Cross-submission on Draft Decision - Cost of Capital Parameters" (25 August 2016), para 14-18. In an earlier submission, NZ Airports stated that "airports have previously advanced the case that a downwards adjustment to asset beta should result in a corresponding increase in leverage" and that it was "further considering whether the Commission's sample set provides empirical support for that position". NZ Airports "Submission on Commerce Commission's input methodologies review draft decision" (4 August 2016), para 175.

446 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, para 1557.

572. 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 42% for EDBs, Transpower and GPBs, and 19% for airports.

Tax

573. This section explains that we have not changed our approach to the corporate and investor tax rates used in estimating WACC.

Corporate tax rate

574. We have maintained the approach of using the statutory corporate tax rate when estimating the WACC. The current statutory corporate tax rate is 28%.

575. 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

576. We have maintained 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.

577. 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.

578. The IM does not provide for the tax circumstances of individual investors.[447] 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.

[447] 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.

Standard error of the WACC

579. This section discusses our 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:[448]

579.1 for EDBs, Transpower, and GPBs, the standard error is used to calculate the 67th percentile WACC estimates used for price-quality path regulation; and

579.2 for airports, we have decided to publish the standard error of the WACC, enabling interested parties to generate a distribution for our WACC estimates.[449]

580. We have determined that the standard error of the WACC should be 0.0101 for EDBs and Transpower, 0.0105 for GPBs, and 0.0146 for airports. This involves two key changes to our 2010 estimates of the standard error of the WACC.

580.1 We have revised 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.

580.2 We have removed 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 means 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.

581. Apart from the two changes listed above, we have continued using the approach (and input values) explained in the 2010 IMs reasons paper when estimating the standard error of the WACC.[450] 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.[451]

Approach to estimating the standard error of the WACC under the 2010 IMs

582. Under the 2010 IMs, we combined standard errors for the asset beta, debt premium and TAMRP to determine an overall standard error of the WACC. We used the

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448 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.

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

450 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) Reasons paper" (December 2010), para H11.1-H11.67.

451 Martin Lally "The weighted average cost of capital for gas pipeline businesses" (28 October 2008), see equation 14 and Appendix 3.

'complex analytical approach' described in the 2010 IMs reasons paper to calculate the standard error of the WACC.[452]

583. The standard errors we determined in the 2010 IMs are shown in Table 10.

Table 10: 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[453]	0.0015	0.0015	0.0015
Asset beta	0.13	0.14	0.16
Overall WACC[454]	*0.0106*	*0.0120*	*0.0146*

584. 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

585. 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.[455] Based on this analysis, we have determined that:

585.1 an updated standard error of the asset beta of 0.12 should apply to EDBs, Transpower, and GPBs; and

585.2 a standard error of the asset beta of 0.16 should continue to apply to airports.

586. Data on the standard error of the asset beta for the energy comparator sample is summarised in Table 11.

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452 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) Reasons paper" (December 2010), para H11.19.

453 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 596 to 599 for further details.

454 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.

455 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 11: Standard error of the asset beta for updated energy comparator sample

	2006-2011	2011-2016	Average
Daily	0.1388	0.1052	0.1220
Weekly	0.1329	0.1226	0.1277
Four-weekly	0.1202	0.1134	0.1168

587. Consistent with our approach to estimating asset beta, we have placed most weight on the weekly and four-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 0.12 (rounded to two decimal places).

588. We have determined that the updated standard error of the asset beta of 0.12 should apply to EDBs, Transpower and GPBs. This results in a decrease in the standard error of the asset beta for EDBs and Transpower from 0.13 to 0.12, and a decrease in the standard error of the asset beta for GPBs from 0.14 to 0.12.[456]

589. We also assessed updated data on the standard error of the asset beta for the airports comparator sample, as summarised in Table 12. Averaging across the weekly and four-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 12: Standard error of the asset beta for updated airports comparator sample

	2006-2011	2011-2016	Average
Daily	0.2394	0.3064	0.2729
Weekly	0.2145	0.3033	0.2589
Four-weekly	0.1859	0.3053	0.2456

590. However, in the original airports IMs decision we adopted a standard error of the asset beta of 0.16 by applying judgement.[457] 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”.

[456] In the 2010 IMs, we set a standard error of the asset beta for GPBs that was slightly above that for EDBs/Transpower (0.14 compared with 0.13), reflecting the "greater perceived riskiness of New Zealand gas pipeline businesses". Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) Reasons paper" (December 2010), para H8.206. Given that we have now halved the asset beta uplift for GPBs from 0.10 to 0.05 (as discussed in paragraphs 339 to 457), we consider that the case for making an adjustment to the standard error of the asset beta for GPBs is significantly reduced. Therefore, we have decided to use the empirical estimate of 0.12 for GPBs, as well as EDBs and Transpower.

[457] Commerce Commission "Input methodologies (airport services) Reasons paper" (December 2010), para E8.107-E8.114.

591. 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.[458] In particular, NZ Airports' expert at the time (Alistair Marsden, from 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.[459]

592. 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.

593. 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:[460]

> …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.

594. 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):[461]

    594.1 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);

    594.2 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

    594.3 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).

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458 Commerce Commission "Input methodologies (airport services) Reasons paper" (December 2010), para E8.114.

459 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.

460 NZ Airports "Submission on Commerce Commission's Input Methodologies Review: Invitation to Contribute to Problem Definition" (21 August 2015), para 76 and 80.

461 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.

595. We have determined 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.[462] In addition, we note that:

595.1 an asset beta of 0.60 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);

595.2 there appears to be significant variation in the standard error of the asset beta for airports between periods (for example, based on weekly and four-weekly observations, the standard error of the asset beta for 2006-2011 is approximately 0.20, but for 2011-2016 it is approximately 0.30);

595.3 although New Zealand Airports Association (**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;

595.4 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;

595.5 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);

595.6 a standard error of the asset beta for airports of 0.16 is consistent with advice from NZAA's expert in 2010 (Uniservices); and

595.7 we decided to no longer publish specific WACC percentile estimates for airports ID, diminishing the importance of our standard error estimate.[463]

Standard error of the debt premium

596. Under the 2010 IMs we used an estimate of the standard error of the debt premium that was the greater value of:

596.1 0.0015; or

[462] Commerce Commission "Input methodologies (Airport Services) reasons paper" (22 December 2010).

[463] Instead we have decided to only publish a mid-point WACC estimate and standard error of the WACC. Under this approach, the standard error of the WACC is only one factor when considering airports' targeted rates of return.

596.2 the result of Equation 1 (which is based on cost of capital IMs for EDB ID, as an example).[464]

Equation 1: 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).

597. Although 0.0015 was 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.[465]

598. Given that the equation for estimating the standard error of the debt premium has never been able to be applied, we proposed in the draft decision that it should be removed from the IMs. Instead, we suggested that a fixed standard error of the debt premium of 0.0015 should apply.

599. However, submissions from the ENA and Contact suggested that we should revise our estimate of the standard error of the debt premium.

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464 *Electricity Distribution Services Input Methodologies Determination 2012* [2015] NZCC 32, clause 2.4.5. The same formula was used for other forms of regulation and other sectors (but different clause references applied).

465 We note that this would have still been the case if majority government owned bonds were given the same weighting as non-majority government owned bonds.

599.1 The ENA submitted that the "continued use of a standard error of 0.0015 for DRP does not make sense" and suggested that "the Commission derive a standard error from the NSS regressions".[466]

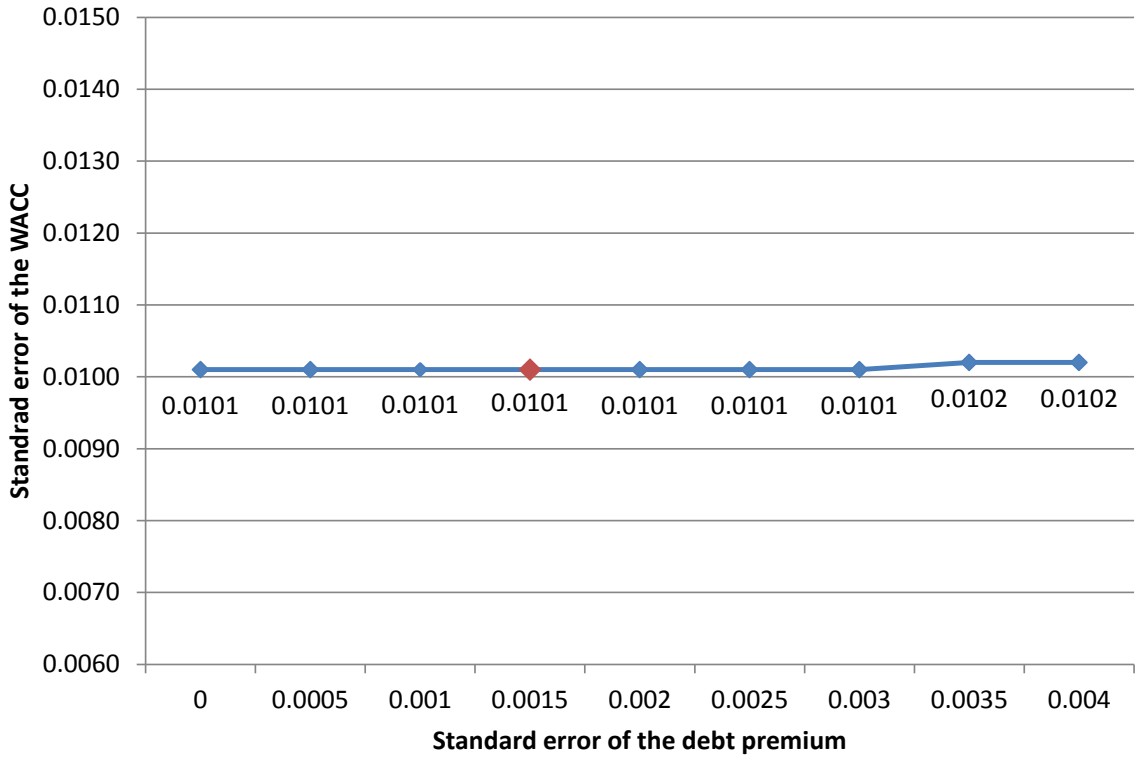
599.2 Contact submitted that using the NSS regressions to derive a standard error would "distort the standard deviation higher due to the data set including bonds rated higher and lower than BBB+, as well as the skew (and greater variation) seen for tenors much shorter or longer than the Commission's 5 year benchmark". Rather, Contact stated that "the standard error should be formulated from the same data set used to determine the debt premium using the typical standard error formula, for reasons of transparency, simplicity and accuracy".[467]

600. Although we acknowledge that our estimate of the standard error of the debt premium of 0.0015 could potentially be refined, this parameter has very little impact on the standard error of the overall WACC (as shown in Figure 13 below). For example, the standard error of the debt premium needs to more than double to have any impact on the standard error of the WACC (when rounded to four decimal places).

[466] ENA "Input methodologies review – Topic paper 4 cost of capital issues – Submission to the Commerce Commission" (4 August 2016), para 97.

[467] Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 10.

Figure 13: Impact of changes in standard error of the debt premium on standard error of the WACC for EDBs/Transpower



601. Given the very limited materiality of changes in the standard error of the debt premium, we consider there is little benefit in undertaking additional analysis of this parameter. We note that there is no obvious alternative method that could be implemented easily.[468]

602. Therefore, we have determined that a fixed standard error of the debt premium of 0.0015 should apply. This simplifies the IMs, by enabling 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.

[468] As noted by Contact Energy, using the NSS regressions to derive a standard error is likely to distort the estimate due to inclusion of: (1) bonds rated higher and lower than BBB+; and (2) bonds with tenors significantly shorter or longer than five years. However, we consider that calculating the standard error using "the same data set used to determine the debt premium using the typical standard error formula" (as suggested by Contact Energy), will not overcome this problem. As noted in paragraph 597, there have not been enough BBB+ rated bonds issued by EDBs or GPBs for the standard error formula in Equation 1 to be applied. Extending the data set to include bonds with different credit ratings and issuers would also raise concerns regarding distortion of the standard error estimate.

Final decisions regarding overall standard error of the WACC

603. Based on the analysis described above, we have determined that the standard errors in Table 13 should apply.[469]

Table 13: Updated standard errors of the WACC under this determination[470]

Parameter	Standard error		
	EDBs/Transpower	**GPBs**	**Airports**
TAMRP	0.015	0.015	0.015
Debt premium	0.0015	0.0015	0.0015
Asset beta	0.12	0.12	0.16
Overall WACC[471]	*0.0101*	*0.0105*	*0.0146*

604. The application of the standard error of the WACC for airports is described in more detail in Topic paper 6.[472]

469 Given the relatively minor change in standard error of the WACC for EDBs/Transpower and GPBs, we consider this should not materially affect the use of the 67th percentile WACC for price-quality path regulation of these sectors.

470 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 0.0101 (for EDBs/Transpower), 0.0105 (for GPBs) and 0.0144 (for airports) when rounded to four decimal places.

471 The standard error of the overall WACC differs slightly between EDBs/Transpower and GPBs, due to the higher asset beta for GPBs of 0.40. See the equation at para H11.19 of the 2010 Input Methodologies reasons paper for details of how the standard error of the WACC is calculated.

472 Commerce Commission "Input methodologies review decisions: Topic paper 6 – WACC percentile for airports" (20 December 2016).

Chapter 6: Additional cost of capital issues

Purpose of this chapter

605. This chapter explains our decisions in respect of the main identified cost of capital issues for the review that do not fit neatly into the cost of debt or the cost of equity chapters above. This includes:

605.1 incentives to apply for a CPP; and

605.2 issues raised by the High Court in its judgment on the merits appeal to the setting of the original IMs, including:[473]

605.2.1 the choice of the SBL-CAPM to estimate the cost of capital;

605.2.2 the appropriate WACC percentile; and

605.2.3 the implementation of a split cost of capital.

Incentives to apply for a CPP

606. The previous IMs apply a prevailing approach to estimating the cost of capital. We determined a new WACC each year that applied to any supplier making a CPP application. The CPP WACC applied 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 previous approach

607. We outlined the potential issue with the current approach to setting a CPP WACC in the problem definition paper.[474] Divergence between the revised WACC that applied to CPPs and a supplier's WACC under a DPP may create perverse incentives for a supplier to either apply or not apply, for a customised price-quality path.

608. 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).

609. If the CPP WACC is lower than the DPP WACC, then a supplier potentially had an incentive not to apply for a CPP.[475] Given the much larger size of the RAB compared to potential new capex over the CPP period, the difference between the CPP and DPP WACC was likely to be a significant driver of whether to apply for a CPP or not.

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

474 Commerce Commission "Input methodologies review invitation to contribute to problem definition" (16 June 2015), Topic 3.

475 Particularly if it has undertaken steps to manage its debt financing risk on the expectation that the WACC will be fixed for five years.

610. 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.[476]

611. 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.[477]

612. In his report, Dr Lally identified four broad solutions to the WACC alignment incentive issue:

    612.1 annual updating of the cost of debt – indexing the price path to the cost of debt (Option 1);

    612.2 using a long-term trailing average cost of debt when setting the WACC (Option 2);

    612.3 applying the DPP WACC to any CPP application (Option 3); and

    612.4 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).[478]

613. 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.

Decision on the approach to the WACC alignment issue

614. We have decided to remove the requirement to determine a CPP-specific WACC from the cost of capital IM. The WACC determined for the DPP will now apply for a fixed term of five years, even for suppliers that move onto a CPP. If a new DPP WACC is determined part way through a CPP, we will reopen the CPP and adjust prices for the remainder of the CPP to reflect that new DPP WACC. The adjusted prices will be consistent with the allowed return on capital over the remainder of the period being equivalent to the new DPP WACC.

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476 For further information on these decisions, see: Commerce Commission: "IM review second process update paper CPP fast track amendments" (9 October 2015).

477 Dr Martin Lally "Complications arising from the option to seek a CPP" (18 September 2015).

478 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 para 674-688.

615. 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 consistent with the time at which the WACC is determined. For example, when determining a forecast of revaluation gains for a CPP, we will use CPI forecasts made at the time the DPP WACC was determined. This earlier CPI forecast could be a number of years prior to the start of the CPP but it ensures consistency with our economic principle of ex-ante FCM.[479] Similarly, when the DPP WACC is updated and we reopen the CPP, we will use an updated forecast of CPI to update the forecast of revaluations for the remainder of the CPP.

616. 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.[480] Fluctuations in interest rates will, therefore, no longer be a significant consideration in whether a supplier applies for a CPP or not.

617. We received a number of submissions both in response to the WACC update paper and draft decision supporting this approach.[481] 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.

618. Powerco also noted that:[482]

> Powerco agrees with the Commission's analysis of the problems arising from having a CPP-specific WACC, and the Commission's proposed solution. As the Commission is aware, this is an issue that has particularly impacted Powerco in recent years. We appreciate the time and care the Commission has given to defining and solving this issue.

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479 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.

480 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.

481 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.

482 Powerco "Submission on input methodologies review – Draft decisions" (4 August 2016), para 322.

619. 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.

620. Aurora provided a submission questioning the validity of the approach when the CPP WACC is above the DPP WACC.[483]

> The proposal to simply set the CPP WACC equal to the DPP WACC is, in many ways, a pragmatic solution to a prevailing problem, but is only valid in circumstances where the CPP WACC would otherwise be lower than the DPP WACC. The solution fails in circumstances where the opposite is the case.

621. We disagree that the solution fails in circumstances in which the CPP WACC would be higher than the DPP WACC. If an alternative higher 'CPP WACC' was available, there would remain a risk that suppliers could be incentivised to apply for a CPP when it was not in the long-term interests of consumers (ie, to achieve an allowance based on a higher WACC, even if its costs have not changed).

622. We consider the most practical approach that minimises the risk of applications that are not in the long-term interests of consumers is to apply DPP WACCs to CPPs. The approach has the added benefit of removing the need to determine a separate CPP WACC each year for EDBs and GPBs.

623. We also 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.

624. We have therefore introduced a WACC reopener to allow us to reconsider a CPP following a WACC change.[484] When reconsidering the path in this context, we will use the new WACC to update the building blocks model that is used to determine a supplier's allowable revenue.[485] We will 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.[486]

625. We aim to minimise the administrative procedure associated with the WACC reopener and therefore plan to limit any changes to material effects on the revenue

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483 Aurora "Submission – Input methodologies review: Draft decision and determination papers" (4 August 2016), p. 11.

484 For example see: *Electricity Distribution Services Input Methodologies Amendments Determination 2016* [2016] NZCC 24, clause 5.6.7.

485 We will not update the TCSD allowance as part of the WACC change because the TCSD is a separate allowance that would be unaffected by any change in the DPP WACC.

486 Commerce Commission "Input methodologies review decisions: Topic paper 6 – WACC percentile for airports" (20 December 2016).

allowance. In the draft decision we restricted revenue changes to the return on capital and forecast of CPI.[487]

626. Following submissions from the ENA and Orion we have extended this to include an update to the forecast regulatory tax allowance due to a change in notional deductible interest.[488] We consider that a change in the cost of debt will have a sufficiently material impact on allowable revenue through the regulatory tax building block, that this will outweigh the administrative costs of undertaking the update process.

627. When setting the revenue allowance for a CPP, we will use the existing DPP WACC to forecast the return on capital allowance for the whole of the CPP period (up to five years). This is because we are required to set a price-path for the whole of the CPP period, even though the path will be reconsidered (and the revenue allowance revised) when a new DPP WACC value is available.

628. Powerco submitted in response to the TCUP that for the part of the CPP that is beyond the next DPP reset we should use a more up-to-date forecast of WACC (ie, estimated at the time a CPP is set), rather than the existing DPP WACC (which may have been estimated a number of years previously).[489]

629. Powerco considered that using a more up-to-date WACC estimate for the latter years of the CPP would mean:

    629.1 a more realistic estimate of the price impact to consumers from a CPP at the time the CPP application is made and consulted on; and

    629.2 a more accurate forecast of revenue, delivering a smaller path adjustment following the WACC reopener.

630. Using a more up-to-date WACC forecast may provide some benefits. However, we consider that these benefits are likely to be small, given the forecast does not affect the actual revenue available under the price path. We also note that, in terms of signalling price changes to consumers, suppliers are able to provide alternative scenarios as part of their customer consultation. This may include a forecast of prices which uses an alternative WACC forecast.

631. We have therefore decided to use the existing DPP WACC when setting the initial CPP revenue allowance for the whole of the CPP period. This is because using

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487 Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 500.

488 ENA "Input methodologies review – Topic paper 2, CPP requirements – Submission to the Commerce Commission" (4 August 2016), para 34; Orion "Submission on input methodologies review – draft decisions" (4 August 2016), para 35.

489 Powerco "Submission on input methodologies review: Technical consultation update paper" (3 November 2016), para 22.2.

separate WACCs to determine the initial CPP revenue allowance results in additional complexity but with limited benefit. As noted by Powerco it has no impact in NPV revenue terms.[490]

Alternative option 1 – Application of a dual WACC approach

632. One of the issues with applying the DPP WACC to existing assets is that it can cause problems with significant new investment under a 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:[491]

> … 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.

633. An alternative approach, as suggested by Dr Lally, is to apply a dual WACC approach.[492] Under this approach, for a CPP:

633.1 the DPP WACC would be applied to existing assets and capex that was originally allowed for under the DPP; and

633.2 the CPP WACC would be applied to additional (incremental) capex provided for under a CPP that was not allowed under the DPP.

634. 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 F 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.

635. 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

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490 Powerco "Submission on input methodologies review: Technical consultation update paper" (3 November 2016), para 25.3.

491 Dr Martin Lally "Complications arising from the option to apply for a CPP" (18 September 2015), p. 4.

492 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 para 674-688.

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.

636. 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:

636.1 identifying CPP and DPP capex;[493]

636.2 the use of single WACC values as inputs to price-quality path calculations (eg, in the IRIS mechanism, timing factors);[494] and

636.3 consideration of how subsequent changes to the WACC would take place once assets were subject to different WACCs.[495]

637. Contact and MEUG suggested that we should at least explore the dual WACC approach.[496]

638. We do not consider the issues identified by suppliers provide insurmountable barriers to implementing a dual WACC approach.[497] 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.

639. We received limited submissions on the dual WACC approach following the draft decision. However, Powerco reiterated their opposition to the dual WACC approach and we received no further submissions in support.[498]

> We also agree with the reasons given by the Commission for not adopting the alternative solution of a dual WACC.While the Commission is correct to observe that in theory such an approach could be written into regulation and applied, we continue to believe that it would give rise to significant, compounding complexities (and, as with any complex regulation, introduce other unforeseen perverse incentives).

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493 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.

494 Orion "Submission on the cost of capital and the IM review" (5 February 2016), para 58.

495 Houston Kemp "Comment on the Commerce Commission's cost of capital update paper" (report prepared for Powerco, 5 February 2016), p. 22.

496 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.

497 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.

498 Powerco "Submission on input methodologies review – Draft decisions" (4 August 2016), para 328.

Alternative option 2 – Update the WACC annually

640. 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.

641. These options were to:

641.1 update the WACC annually; and

641.2 apply a trailing average approach.

642. These options could potentially have helped to reduce the CPP incentive issues. However both options:

642.1 would have still resulted in at 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

642.2 have already been rejected as a change to the cost of debt for other reasons.

643. 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.[499] 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

644. 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 cost of equity and the SBL-CAPM is a version that best fits the particular features of the New Zealand taxation system.

645. The problem definition paper identified that the High Court questioned the suitability of the SBL-CAPM, particularly with regard to the 'leverage anomaly'.[500]

646. 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

499 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.

500 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.

alternatives to the SBL-CAPM were the main reasons given for this view. For example PwC suggested that:[501]

> 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.

647. 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.[502]

648. 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:[503]

> 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 bias in the SBL-CAPM (placing some weight on both the adjusted and unadjusted SBL-CAPMs).

649. MGUG submitted more strongly that we should consider alternative models.[504]

> 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.

650. 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

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501 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.

502 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.

503 Transpower's submission "Update paper on the cost of capital" (5 February 2016), p. 1.

504 MGUG "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), para 9.

regulated business are based overseas and we use overseas firms in the comparator sample to determine some parameter inputs.[505]

651. MEUG submitted that although it agreed with the decision to use SBL-CAPM, it considered that its flaws were costing consumers between $62m and $132m p.a and we should to work on rectifying issues with the current model:[506]

> Our agreement to retain the status quo does not mean we have to change our long standing view that the SBL-CAPM has material flaws. Those flaws should not be waived away or forgotten, and the Commerce Commission should continue to work on possible solutions given the materiality of the flaws.

652. Wellington airport also showed scepticism in the ability of the SBL-CAPM to estimate an appropriate cost of capital. However they provided no alternative suggestion to estimate the WACC:[507]

> A CAPM derived WACC for the New Zealand airport sector is unlikely to reflect the returns airports would target in a competitive market. Parameter error is inevitable given the distortions in the government bond market, and the small group of listed comparator airports. More generally, the assumptions underpinning the CAPM have been discredited.

653. 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:

    653.1 Black CAPM because there was no clear evidence of its superiority to SBL-CAPM and the fact it has not been widely used elsewhere.[508] We also noted that the use of a five-year risk-free rate (rather than shorter-term risk-free rates often used in academic studies) is likely to flatten the securities

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505 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.

506 MEUG "Submission on Input methodologies draft review decisions" (4 August 2016), para 30-32.

507 Wellington Airport submission on IM review draft decisions papers "IM review" (4 August 2016), para 24 28.

508 We note that the AER has provided some weight to the theories of the Black CAPM when determining equity betas. However it has 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.

market line (due to the higher price of longer-term debt) mitigating the impact of any low beta bias.[509]

653.2 Fama/French model because of difficulties in obtaining data and ongoing debate on its theoretical merits.[510]

653.3 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).

654. 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.

655. 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.

656. 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.[511]

657. 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.

658. 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.[512] The simplicity and intuition of the SBL-CAPM also works to its advantage.

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509 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.

510 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para H2.26.

511 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services) reasons paper" (22 December 2010), para 6.4.35.

512 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.

659. We have therefore not changed, as part of this review, the choice of model used to estimate the cost of equity when determining the WACC. We do however remain open to moving to alternative models to estimate the cost of equity in future if there are good reasons for doing so.

Black's simple discounting rule

660. 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.

WACC percentile

661. 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.

662. 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.[513] This amendment reduced the percentile used for price-quality regulation in the electricity and gas sectors from the 75th to 67th percentile.[514]

663. Submissions from suppliers agreed with our view that this should not be a topic of focus for the review. For example Orion noted that:[515]

> 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.

664. 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

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

514 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), para 256-258.

515 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.

evidence from recent transactions of regulated businesses to support a lower WACC.[516]

665. Contact also submitted that it was concerned that the decision not to review the use of the 67th percentile was taken too lightly.[517] In particular it submitted that:

- New technologies and related new business models were not considered in the dynamic efficiency arguments for the 2014 decision. As new technologies and business models provide alternates to network investment this dynamic efficiency analysis should be revisited;
- RAB multiples have continued to trend well above 1.0;
- There has been no observable trend towards under-investment since the Commission's decision to move from 75th to 67th percentile, rather evidence is that these businesses have continued to undertake significant capital expenditure; and
- There is now a refined reliability incentive scheme in place (which was only 'proposed' at the time of the 2014 review).

666. We have considered the Contact submission and remain of the view that there is no evidence before us that currently convinces us we should change the WACC percentile as part of the current IM review.

667. The review of the percentile took place in 2014 and involved a substantial amount of analysis and extensive consultation. To revisit this work so soon would undermine one of the key benefits of the WACC percentile given the following.

667.1 Frequent reviews will devalue investor confidence in the percentile.

667.2 It is too early to reach any view on the impact of the percentile. We disagree with Contact's comment that any conclusions can be drawn from the nature of investments in the two years since the percentile was changed, many of which may have been planned prior to the percentile change.

667.3 No actual evidence has been presented as a case for change during this review which would suggest that, notwithstanding the points made above, further consideration should be given to revisiting the WACC percentile.

[516] RAB multiples are discussed in more detail in Chapter 7.

[517] Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 35.

668. We recognise the importance of dynamic efficiency and the greater potential that emerging technologies bring. However, we do not currently consider that the impact of these technologies would affect the analysis we undertook in 2014 in a meaningful way, given that:

668.1 it still very unclear how emerging technologies will impact the electricity sector and therefore it would be premature to make changes to the percentile at this time;[518] and

668.2 we note the 2014 review considered innovation more generally and ruled it out as a benefit of a higher WACC percentile.

669. While we have put in place a refined reliability incentive scheme, this was taken into account in our original analysis in 2014.[519]

670. Contact suggested that a further review of the WACC percentile should take place within the next two years.[520] We disagree because:

670.1 a sufficient length of time is required before re-assessment, given the points raised above; and

670.2 at that time, we should also have a much fuller picture of the impact of emerging technologies on network investment.

671. However, we consider that ongoing evaluation of RAB multiples and investment outcomes is useful and we will continue to monitor such issues to provide an evidence base for the next review. At the time of the next review we intend to carefully examine the evidence of whether a WACC percentile uplift has delivered benefits to consumers in both the electricity and gas sectors.

672. We therefore 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.

673. We have, however, considered the WACC percentile range in relation to airports, because the airport sector was not part of the final 2014 analysis. Our assessment of

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518 Further details of our views on the impact of emerging technologies are provided in Topic paper 3: Commerce Commission "Input methodologies review decisions: Topic paper 3 – The future impact of emerging technologies in the energy sector" (20 December 2016).

519 Commerce Commission "Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services – Reasons paper" (30 October 2014), para 5.61.2.

520 Contact Energy submission on IM review draft decisions papers "Input methodology review" (4 August 2016), p. 38.

the relevance of the WACC percentile range for airports is considered in Topic paper 6.[521]

Split cost of capital

674. 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). [522]

675. 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.

676. 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.[523]

677. 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.[524] A more recent study has 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.[525]

678. 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 a lower WACC should be applied to assets as soon as they enter the RAB, whereas MEUG's proposal appears to indicate that it would expect an asset to receive the higher WACC for a longer period of time.

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

522 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].

523 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 4.46-4.47.

524 For example: Dieter Helm, "Ownership, utility regulation and financial structures: an emerging model" (14 January 2006). Available at: www.dieterhelm.co.uk/node/632.

525 Commerce Commission "Input methodologies review: Update paper on the cost of capital topic" (30 November 2015), para 4.33-4.44.

679. 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 a split cost of capital

680. 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.

681. The main benefits would accrue from:

681.1 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

681.2 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.

682. 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:

682.1 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.

682.2 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.

683. 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.

684. Given the potential for these disadvantages to be significant, we have decided not to apply a split cost of capital approach when setting the cost of capital for regulated

suppliers. In taking that position we consider the following factors are particularly relevant.

684.1 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. [526]

684.2 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.

684.3 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.

684.4 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.

684.5 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.

685. 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:[527]

> 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.

686. Other submissions from suppliers also agreed with our proposal not to undertake further work in this area.[528]

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

527 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 11.

687. MEUG submitted that it still considered that ongoing evaluation of the split cost of capital would be useful but it provided no specific information on how this might be undertaken or how it envisaged a split cost of capital might be implemented.[529]

688. 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. As a result we have not introduced a split cost of capital approach in the IMs.

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[528] 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 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.

[529] MEUG "Submission on cost of capital update paper" (5 February 2016), para 13-17.

Chapter 7: Reasonableness checks

Purpose of our this chapter

689. This chapter discusses whether our WACC estimates, based on the decisions 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.

690. 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.[530]

691. Unless otherwise indicated, all relevant calculations and reasonableness checks discussed in this chapter were conducted using the revised cost of capital IMs, updated to reflect changes discussed in this paper (which we refer to in this chapter as the 'amended cost of capital IM').

692. Based on the analysis we have undertaken, we consider that our WACC estimates based on the amended cost of capital IMs are reasonable.[531] In particular:[532]

    692.1 Our 67th percentile post-tax WACC estimate for EDBs and Transpower of 5.37% 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).

    692.2 Although limited evidence is available to test the reasonableness of our 67th percentile post-tax WACC estimate for GPBs of 5.76%, 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 more than sufficient to compensate investors for putting their capital at risk (even after allowing for the expected impact of reducing the beta for GPBs).

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530 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.

531 Our WACC estimates referred to in this chapter were calculated using a risk-free rate estimated as at 1 April 2016.

532 Our reasonableness checks analysis focusses on the 67th percentile WACC estimates 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 estimates of 4.92% and 5.30% respectively, are also within the range of comparative information considered.

692.3 Our mid-point post-tax WACC for airports of 6.29% is within the range of alternative New Zealand sourced post-tax WACC estimates for airports, and within the range of overseas WACC estimates from the UK and Ireland (after normalising for differences in risk-free rates).

693. The rest of this chapter:

693.1 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;

693.2 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;

693.3 describes in detail the comparative information used when undertaking reasonableness checks for EDBs/Transpower, GPBs, and airports, respectively;

693.4 outlines the RAB multiples analysis we have undertaken, as an additional reasonableness check; and

693.5 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

694. This section explains the approach we have used when undertaking reasonableness checks of our WACC estimates, including:

694.1 the publicly available comparative information we have considered;

694.2 the weight placed on WACC estimates from different sources; and

694.3 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

695. When undertaking our reasonableness checks, we have used publicly available information on:

695.1 the current New Zealand post-tax risk-free rate and the post-tax cost of corporate debt;

695.2 historic and forecast estimates of the returns achieved on New Zealand investments of average risk;

695.3 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

695.4 estimates of the post-tax WACC from other regulatory contexts, particularly Australia and the United Kingdom.

696. Our WACC estimates for EDBs/Transpower/GPBs and airports, as at 1 April 2016, are compared to the publicly available information listed above.[533] Our WACC estimates are calculated based on the amended cost of capital IMs set out in this paper. If the 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 will be linked to prevailing market rates.

697. 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

698. 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.

698.1 *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).[534]

698.2 *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.

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[533] Although we have used a risk-free rate estimated as at 1 April 2016, for simplicity, we have used the debt premium values set out in Attachment G. The five-year historical debt premium values incorporate some data beyond April 2016.

[534] 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.

698.3 *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.

699. 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".[535]

We have normalised for differences in risk-free rates

700. We have normalised the comparator WACC estimates for differences in risk-free rates.[536] 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, or estimating the risk-free rate at a different date.

701. Under the amended cost of capital IM, we use prevailing interest rates when determining the risk-free rate.[537] In contrast, some other analysts and regulatory authorities use long-term averages when estimating the risk-free rate.

702. 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.[538]

703. 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%).[539]

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535 *Wellington Airport & others v Commerce Commission* [2013] NZHC 3289, at [1213].

536 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.

537 Using prevailing interest rates when determining the risk-free rate is consistent with our approach in the 2010 IMs.

538 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%.

539 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.

We have considered RAB multiples, as an additional reasonableness check

704. 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 set at a sufficient level to adequately compensate investors for putting their capital at risk.[540]

705. 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 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

706. We consider that our WACC estimates are reasonable based on the comparative information we have assessed. Our findings for EDBs/Transpower/GPBs and airports are summarised in Figure 14 and Figure 15, respectively.

707. Our analysis for EDBs and Transpower 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 5.37% (as at 1 April 2016) is reasonable given it is:

    707.1 below the long-term historical return (8.72%) and the forecast return on New Zealand investments of average risk (7.21%-7.39%), but well above the post-tax returns on five-year government stock (1.87%) and five-year BBB+ bonds (3.20%). 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;

    707.2 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

[540] See paragraphs 744 to 771 for further discussion on RAB multiples.

unregulated activities (ranging from 5.56% to 7.15%, with an average of 6.19%);[541] and

707.3 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 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).[542]

708. 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 6.29% (as at 1 April 2016) is reasonable given it is:

708.1 below the long-term historical (8.72%) and the forecast return on New Zealand investments of average risk (7.21%-7.39%), but well above the post-tax returns on five-year government stock (1.87%) and five-year A- bonds (2.92%). 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;

708.2 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 above Deutsche Bank's estimate for the regulated segment of Auckland International Airport's (AIAL) business (6.17%) and the post-tax WACC of 6.28% that Dunedin International Airport used for its 2014 disclosure year, 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 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%;[543] and

708.3 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

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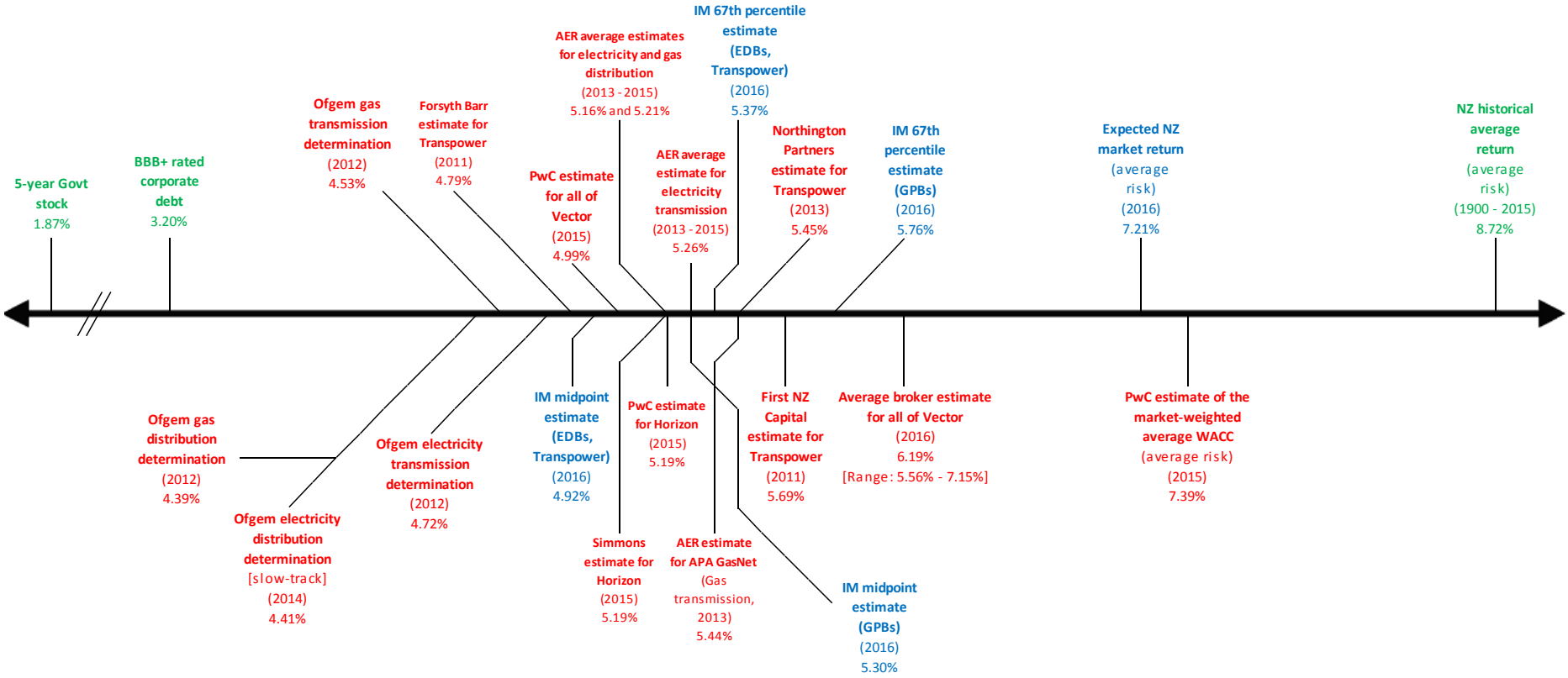
541 As explained in paragraph 721, the post-tax WACC for regulated electricity distribution and gas pipeline services is expected to be lower than for the other services provided by Vector.

542 The UK WACCs from Ofgem were presented as real vanilla estimates, so we have converted these to post-tax nominal estimates to make them comparable with the other estimates presented. This required making several assumptions, so we consider that the UK WACC estimates (and overseas estimates in general) should be given less weight when undertaking reasonableness checks.

543 Auckland Airport 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.

UK (6.11% for Heathrow and 6.42% for Gatwick) and the Commission for Aviation Regulation (**CAR**) in Ireland (6.09% for Dublin Airport).

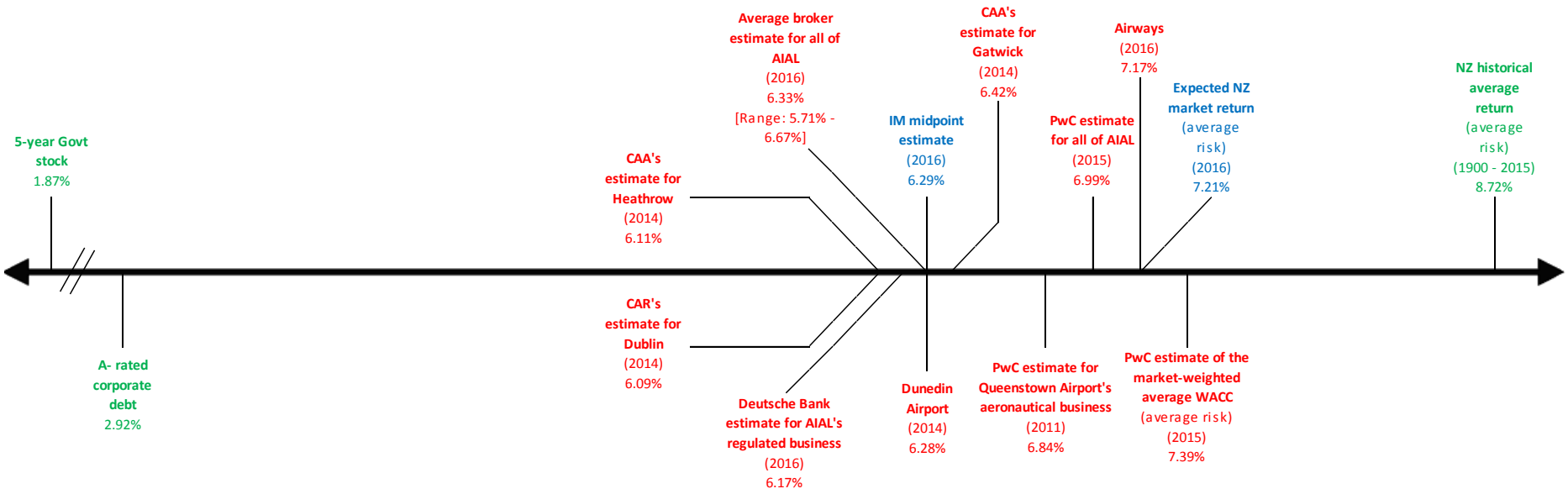
Figure 14: Summary of WACC reasonableness checks for EDBs, Transpower, and GPBs (using normalised risk-free rates)



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 699, 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 15: 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 699 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).

709. We have given particular attention to the reasonableness of our 67th percentile WACC estimate for gas pipeline services of 5.76%, given our decision to reduce the asset beta uplift from 0.10 to 0.05. Although limited evidence is available to test the reasonableness of our WACC estimate for GPBs, we note that:

709.1 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 previous approach of applying a 0.10 asset beta uplift for gas "may be considered favourable to GPBs");[544] and

709.2 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 more than sufficient to compensate investors for putting their capital at risk.[545] Specifically, the RAB multiples reported for the Vector sale range from 1.33x to 1.50x (or 1.25x to 1.41x, after adjusting for the expected impact of reducing the asset beta for GPBs from 0.44 to 0.40, and leverage from 44% to 42%). We have estimated a RAB multiple for the Maui sale of 1.17x (or 1.10x, after adjusting for the expected impact of reducing the asset beta and leverage).

710. 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

711. This section explains the comparative information used when assessing the reasonableness of our WACC estimates for EDBs/Transpower and GPBs in more detail. A summary of the information considered is contained in Figure 14.

Our WACC estimate for EDBs/Transpower and GPBs as at 1 April 2016

712. Our WACC estimates for EDBs, Transpower and GPBs calculated using the amended cost of capital IM are shown in Table 14 and Table 15. The figures are based on the amended cost of capital IMs contained in this decision. The risk-free rate is calculated as at 1 April 2016.

[544] Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), para H13.71-H13.74.

[545] See para 744 to 771 for further discussion on RAB multiples.

Table 14: WACC estimate for EDBs and Transpower as at 1 April 2016

Parameter	Estimate	Standard error
Risk-free rate	2.60%	
Debt premium[546]	1.84%	0.0015
Leverage	42%	
Asset beta	0.35	0.12
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	0.60	
Cost of equity	6.07%	
Cost of debt	4.64%	
Vanilla WACC (mid-point)	**5.47%**	0.0101
Vanilla WACC (67th percentile)	**5.91%**	
Post-tax WACC (mid-point)	**4.92%**	0.0101
Post-tax WACC (67th percentile)	**5.37%**	

Table 15: WACC estimate for GPBs as at 1 April 2016

Parameter	Estimate	Standard error
Risk-free rate	2.60%	
Debt premium[547]	1.86%	0.0015
Leverage	42%	
Asset beta	0.40	0.12
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	0.69	
Cost of equity	6.70%	
Cost of debt	4.66%	
Vanilla WACC (mid-point)	**5.84%**	0.0105
Vanilla WACC (67th percentile)	**6.31%**	
Post-tax WACC (mid-point)	**5.30%**	0.0105
Post-tax WACC (67th percentile)	**5.76%**	

[546] See Attachment G for details of how the debt premium estimate of 1.84% was calculated.
[547] See Attachment G for details of how the debt premium estimate of 1.86% was calculated.

713. As noted in paragraph 707 above, our reasonableness checks analysis focusses on our 67th percentile post-tax WACC estimates for EDBs/Transpower and GPBs of 5.37% and 5.76%, respectively. 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

714. Our 67th percentile post-tax WACC estimate for EDBs and Transpower of 5.37% is comfortably within the plausible range we have considered, which is bounded:

714.1 at the lower end, by post-tax yields on five-year Government stock of 1.87% and five-year BBB+ rated corporate debt of 3.20%; and

714.2 at the upper end, by the future return expected from the New Zealand market for a firm of average risk of 7.21% (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).

715. Our WACC estimate for EDBs and Transpower 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 and Transpower, 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.

716. We have estimated a future return expected from the market (using the simplified Brennan-Lally CAPM) of 7.21%, 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 1.84%, debt issuance costs of 0.20% per annum and a corporate and investor tax rate of 28%.[548]

717. PwC's most recent estimate of the market-weighted average post-tax WACC for around 100 New Zealand listed companies is 8.4%.[549] 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%).

718. 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.[550] Dimson,

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548 For simplicity, we have used our BBB+ debt premium estimate for EDBs and Transpower of 1.84% when estimating the future return expected from the market.

549 PwC "Appreciating Value New Zealand" (Edition six, March 2015).

550 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

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.[551] 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

719. 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 16, have been sourced from:

719.1 Simmons;[552]

719.2 Northington Partners;[553]

719.3 Forsyth Barr;[554]

719.4 First NZ Capital;[555]

719.5 PwC;[556] and

719.6 research analysis employed by New Zealand investment banks.[557]

(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.

551 Dimson, Marsh and Staunton, "Credit Suisse Global Investment Returns Yearbook 2016".

552 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).

553 Northington Partners "Transpower New Zealand – Valuation Assessment" (15 November 2013).

554 Forsyth Barr "Transpower – Capex coming to fruition" (8 November 2011).

555 First NZ Capital "Transpower – A valuation perspective" (31 October 2011).

556 PwC "Appreciating Value New Zealand" (Edition six, March 2015).

557 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.

Table 16: 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%.

720. After normalising for differences in risk-free rates, our 67th percentile post-tax WACC estimate for EDBs and Transpower of 5.37% is within the range of independent estimates. Specifically, our 67th percentile estimate is:

720.1 above the Simmons WACC estimate for Horizon of 5.19%;

720.2 above the PwC WACC estimates for all of Vector and Horizon of 4.99% and 5.19% respectively;

720.3 above the Forsyth Barr WACC estimate for Transpower of 4.79%;

720.4 below the Northington Partners and First NZ Capital estimates for Transpower of 5.45% and 5.69%, respectively; and

720.5 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%).

721. 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.[558] 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 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.

[558] Commerce Commission "Input methodologies (Electricity Distribution and Gas Pipeline Services): Reasons Paper" (December 2010), para H13.54.

Overseas estimates of the regulated cost of capital

722. 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:

722.1 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%;[559] and

722.2 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%.[560]

723. The AER WACC estimates we have considered are very similar to our 67th percentile estimate for EDBs and Transpower of 5.37%, after normalising for differences in the risk-free rate. Based on the AER WACC estimates listed in Table 17, the average WACC for:

723.1 electricity distribution is 5.17%;

723.2 electricity transmission is 5.26%;

723.3 gas distribution is 5.21%; and

723.4 gas transmission is 5.44% (noting that the only estimate included is from the 2013 determination for APA GasNet Australia).

559 The tax rate of 30% is based on the statutory corporate tax rate.

560 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 17: 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%

724. As shown in Table 18, recent Ofgem WACC estimates for electricity distribution, electricity transmission, gas distribution, and gas transmission, are below our 67th percentile WACC estimates for EDBs and Transpower of 5.37% (after normalising for difference in risk-free rates).[561]

Table 18: 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

725. In the 2010 IMs, we adopted an asset beta for GPBs that was 0.10 higher than for 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.[562]

726. As explained in the asset beta section above, we have determined that the asset beta uplift for GPBs should decrease from 0.10 to 0.05.[563] This reflects updated analysis suggesting that the upwards adjustment we made to the asset beta for GPBs in 2010 should be reduced.

727. The reasonableness checks we have undertaken support our lower WACC estimate for GPBs, reflecting the reduced asset beta. In particular, we note that:

727.1 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;[564] and

561 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).

562 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), para H13.72.

563 See para 339 to 457.

564 Commerce Commission "Input methodologies (electricity distribution and gas pipeline services): Reasons paper" (December 2010), para H13.72.

727.2 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 more than 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 0.40 and leverage from 44% to 42%.[565]

Further details on reasonableness checks for airports

728. This section explains the comparative information used when assessing the reasonableness of our WACC estimate for airports in more detail. A summary of the information considered is contained in Figure 15.

Our WACC estimate for specified airport services as at 1 April 2016

729. Our WACC estimate for airports is shown in Table 19. The figures are based on the amended cost of capital IMs contained in this decision. The risk-free rate is calculated as at 1 April 2016.

Table 19: WACC estimate for airports as at 1 April 2016

Parameter	Estimate	Standard error
Risk-free rate	2.60%	
Debt premium[566]	1.45%	0.0015
Leverage	19%	
Asset beta	0.60	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	0.74	
Cost of equity	7.05%	
Cost of debt	4.25%	
Vanilla WACC (mid-point)	**6.52%**	0.0146
Post-tax WACC (mid-point)	**6.29%**	0.0146

730. As noted in paragraph 707.1 above, our reasonableness checks analysis focusses on our mid-point post-tax WACC estimate for airports of 6.29%. This reflects our decision to only publish mid-point WACC estimates for airports (along with the

565 Specifically, the RAB multiples reported for the Vector sale range from 1.33x to 1.50x (or 1.25x to 1.41x, after adjusting for the expected impact of reducing the asset beta and leverage for GPBs). We have estimated a RAB multiple for the Maui sale of 1.17x (or 1.10x, after adjusting for the expected impact of reducing the asset beta and leverage). See paragraphs 744 to 771 for further details.

566 See Attachment G for details of how the debt premium estimate of 1.45% was calculated.

standard error of the WACC, which can be used to calculate different percentile estimates).

The plausible range

731. Our mid-point post-tax WACC estimate for airports of 6.29% is comfortably within the plausible range we have considered, which is bounded:

731.1 at the lower end, by post-tax yields on five-year Government stock of 1.87% and five-year A- rated corporate debt of 2.92%; and

731.2 at the upper end, by the future return expected from the New Zealand market for a firm of average risk of 7.21% (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).

732. 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).[567]

733. We have estimated a future return expected from the market (using the simplified Brennan-Lally CAPM) of 7.21%, 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 1.84%, debt issuance costs of 0.20% per annum and a corporate and investor tax rate of 28%.[568]

734. PwC's most recent estimate of the market-weighted average post-tax WACC for around 100 New Zealand listed companies is 8.4%.[569] 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%).

735. 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.[570] Dimson,

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567 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].

568 For simplicity, we have used our BBB+ debt premium estimate for EDBs and Transpower of 1.84% when estimating the future return expected from the market.

569 PwC "Appreciating Value New Zealand" (Edition six, March 2015).

570 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

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.[571] 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 and similar businesses

736. 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 20, have been sourced from:

736.1 Deutsche Bank;[572]

736.2 Dunedin Airport;[573]

736.3 PwC;[574]

736.4 research analysts employed by New Zealand investment banks;[575] and

736.5 Airways NZ.[576]

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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.

571 Dimson, Marsh and Staunton, "Credit Suisse Global Investment Returns Yearbook 2016".

572 Deutsche Bank "Markets Research – Auckland Int. Airport" (19 February 2016).

573 Dunedin International Airport Limited "2014 Disclosure Financial Statements" (27 November 2014).

574 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).

575 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.

576 Airways New Zealand Ltd "Airways' pricing for the 2016-2019 period: Consultation response document" (May 2016), p. 30.

Table 20: 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%.

737. After normalising for differences in risk-free rates, our mid-point post-tax WACC estimate for airports of 6.29% is similar to alternative New Zealand sourced estimates. Specifically, our mid-point estimate is:

737.1 above the Deutsche Bank estimate for the regulated segment of Auckland Airport's business of 6.17%;

737.2 above the post-tax WACC of 6.28% that Dunedin International Airport used for its 2014 disclosure year;

737.3 below the PwC estimate for Queenstown Airport's aeronautical business of 6.84%;[577]

737.4 below the PwC estimate for AIAL's entire business of 6.99%;

737.5 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

737.6 below the Airways NZ WACC estimate of 7.17%, based on its pricing for the 2016-2019 period.

738. We would generally expect estimates of Auckland Airport'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,

[577] 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.

property etc), but the IM focusses solely on regulated airport services (ie, aeronautical activities). We note that:

738.1 Deutsche Bank has estimated a WACC for AIAL's regulated business that is lower than for AIAL Group;[578]

738.2 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;[579] and

738.3 Auckland Airport has previously acknowledged that its unregulated services would be expected to have a higher post-tax WACC than its regulated services.[580]

739. 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 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 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.

740. 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.

741. However, we have placed limited weight on the Airways NZ estimate. We note that:

741.1 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 6.29% is based on the mid-point); and

578 Deutsche Bank "Markets Research – Auckland Int. Airport" (19 February 2016), p. 13.

579 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.

580 Auckland International Airport Limited "Airport regulation and pricing - Issues Brief" (November 2006), p. 5.

741.2 the High Court previously questioned the value of Airways NZ's self-estimates as a reasonableness check for our airports WACC estimate.[581]

Overseas estimates of the regulated cost of capital

742. 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.[582] To enable comparison with our mid-point post-tax WACC estimate, we have converted:

742.1 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%;[583] and

742.2 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%.[584]

743. As shown in Table 21, our mid-point WACC estimate for airports of 6.29% is within the range of the CAA and CAR estimates (after normalising for differences in risk-free rates).

Table 21: 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

744. As part of our reasonableness checks, we have considered RAB multiples for regulated energy and airports businesses in New Zealand. RAB multiples can provide

581 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].

582 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).

583 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.

584 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.

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.

745. The RAB multiple of a regulated business is the ratio of its enterprise value to its RAB.[585] 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.

746. 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).

747. 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:

    747.1 the regulatory allowed rate of return was too high; or

    747.2 the market expected the company to outperform cash-flow or other model assumptions used in the regulatory determination.

748. 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 and 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.[586]

Summary of RAB multiples evidence we have considered

749. 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:

    749.1 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);

    749.2 the sale of Maui's gas transmission assets to First State Funds, which was announced in December 2015 (and completed in June 2016);

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[585] The enterprise value is calculated as the sum of the market value of net debt and the market value of the shareholders' equity.

[586] 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.

749.3 the takeover of 22.71% of shares in Horizon by Eastern Bay Energy Trust in June 2015; and

749.4 regulated businesses that are publicly listed, specifically Vector and AIAL.

750. 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.

751. The RAB multiples evidence we have considered is summarised in Table 22 and Table 23. Table 22 contains available RAB multiples for EDBs (ie, Vector and Horizon) and AIAL, while Table 23 focuses on the recent sales of Vector and Maui's gas assets to First State Funds.[587]

Table 22: Summary of RAB multiples for regulated EDBs and airports[588]

	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.

587 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.

588 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).

Table 23: Summary of RAB multiples for recent Vector and Maui gas asset sales[589]

	RAB multiple	RAB multiple (adjusted for reduced beta)*
Vector sale of gas assets to First State Funds		
Craigs Investment Partners (Nov 2015)**	1.33x	1.25x
Macquarie (Nov 2015)	1.47x	1.38x
First NZ Capital (Nov 2015)***	1.4x - 1.5x	1.32x - 1.41x
Maui sale of gas assets to First State Funds		
Commerce Commission estimate (Dec 2015)[590]	1.17x	1.10x

Notes: * The RAB multiples in this column reflect the impact that may be expected from our decision to reduce the gas asset beta from 0.44 to 0.40, and leverage from 44% to 42%. This reduces the post-tax WACC by approximately 6% (from 6.10% to 5.76%), and the return on capital by approximately 6%. Therefore, holding other factors constant, we expect this would reduce the observed RAB multiples for gas pipelines by approximately 6%.

** 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.

752. We consider that the available RAB multiples for electricity lines and airports (as shown in Table 22 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 more than sufficient to compensate investors for putting their capital at risk. This conclusion is likely to hold under our amended cost of capital IM, given that we have not made material changes to our approach to estimating WACC for these sectors.

753. 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.

589 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).

590 We have updated the RAB multiple for the Maui sale since the draft decision, to reflect the updated closing RAB value as at December 2015.

754. We have paid particular attention to the RAB multiples for sale of Vector and Maui's gas assets (as shown in Table 23), given:

754.1 our decision to reduce the asset beta for GPBs from 0.44 to 0.40; and

754.2 the lack of independent New Zealand sourced WACC estimates to assess the reasonableness of our WACC estimate for GPBs.

755. The observed multiples for the Vector and Maui gas sales support the reasonableness of our WACC estimate for GPBs. The observed multiples are all above 1, even after adjusting for the expected impact of reducing the asset beta for GPBs from 0.44 to 0.40 (and leverage from 44% to 42%). This suggests that the current regulatory settings are more than sufficient to compensate investors for putting their capital at risk (even after allowing for the expected impact of reducing the beta for GPBs).

755.1 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 1, ranging from 1.33x to 1.50x (or 1.25x to 1.41x, after adjusting for the expected impact of reducing the asset beta and leverage for GPBs).

755.2 Although the RAB multiples for the Maui sale are lower than for Vector, they are still in excess of 1. We have estimated a RAB multiple for the Maui sale of 1.17x (or 1.10x, after adjusting for the expected impact of reducing the asset beta and leverage for GPBs).

755.3 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).

756. First State Investments stated that it appreciates that "regulatory asset base (RAB) multiples, if appropriately interpreted, can be a helpful benchmark for assessing the reasonableness of WACC estimates". However, First State Investments submitted that:[591]

> …the evidence presented by the Commission on RAB multiples for the Vector Gas and Maui pipeline transactions shows that the Commission's proposal to reduce the gas asset beta is not reasonable. Instead of deriving comfort from the test, the result should have led the Commission to question the appropriateness of reducing the asset beta for gas pipelines.

[591] First State Investments submission "Input methodologies review: Cost of capital" (4 August 2016), p. 1-2.

757. First State Investments also submitted that "there are a number of very important reasons why all transactions involving regulated assets are currently being undertaken at RAB multiples in excess of 1", including:[592]

757.1 *The nature of the transaction.* First State Investments noted that the specifics of each transaction can justify paying above RAB since additional value can be held in things such as the value of existing and potential unregulated activities, intangibles, and whether the investor acquires control of the regulated business.

757.2 *The inherent logic of incentive regulation*. First State Investments noted that incentivising regulated businesses to generate cost savings for consumers requires regulated businesses to be able to share in the efficiency gains they can generate, justifying RAB multiples above 1.

757.3 *Growth potential*. First State Investments noted that it benefits directly from growing demand for gas distribution, since it is subject to a weighted average price cap. It also noted that it benefits from growing demand for gas transmission, since it reduces risk and increases opportunities to provide unregulated services, and from investing in new capital to maintain the networks.

757.4 *Intrinsic value to investors*. First State Investments stated that the market price of a transaction is influenced by the particular investor, and that investor may derive specific sources of value from the transaction. It noted that the following sources of value could justify RAB multiples above 1: scarcity value, capital availability, investors having a greater risk appetite than the benchmark efficient capital structure, strategic value, and portfolio benefits.

757.5 *Use of the 67th percentile*. First State Investments noted that the asymmetry of consequences in setting WACC means that RAB multiples should exceed 1, rather than using 1 as a benchmark of reasonableness. It stated that it is inconsistent for the Commission to aim high when setting WACC (by using the 67th percentile of its range of WACC estimates), and then expect RAB multiples of 1.[593]

758. Further, First State Investments submitted that:[594]

- A RAB multiple of 1 is not an appropriate benchmark for the gas transmission and distribution businesses that we purchased. In our view, a RAB multiple of less than about

592 First State Investments submission "Input methodologies review: Cost of capital" (4 August 2016), p. 3-7.

593 As noted in paragraph 763.2 below, we estimate that if our mid-point WACC estimate exactly matched the firm's 'true' WACC, using the 67th percentile would be expected to lead to a RAB multiple of approximately 1.08x (other things being equal).

594 First State Investments submission "Input methodologies review: Cost of capital" (4 August 2016), p. 2.

1.25 after adjusting for the proposed WACC should be of concern to the Commission that its WACC estimate is less than the minimum the market would expect.

- The observed difference in estimated RAB multiples for electricity lines businesses and adjusted RAB multiples for the gas transmission and distribution pipelines previously owned by Maui and Vector clearly signals a market view that the cost of capital for gas pipelines is persistently higher than for electricity networks. By reducing the gas asset beta, the implied RAB multiples from the recent gas transactions are lower than RAB multiples for regulated electricity networks and airports.

759. MGUG, on the other hand, submitted that the available RAB multiples evidence does not suggest that the regulatory settings are "sufficient", but rather that they are "demonstrably excessive". MGUG referred to two observations which "appear to support the idea that the WACC methodology systematically underestimates actual profitability":[595]

759.1 Colonial First State Global Asset Management (**CFSGAM**) has indicated that, despite spending more than the value of the RAB, its purchase of the Vector gas pipeline assets "offers an attractive anticipated cash yield and return profile in line with GDIF's target return".[596] MGUG noted that the target return profile is net IRR of 9-11% pa (including a cash yield of 4-6% pa), in comparison with 67th percentile WACC determinations for GTBs of 6.35% and 7.18% in July 2015.[597]

759.2 The Commission's analysis of EDB profitability indicates that in most cases investment was substantially higher than historically. MGUG stated "we find it surprising that EDBs would increase investment considerably above historical rates when on the face of it they were unable to achieve a return on capital on their existing investment".[598]

760. MGUG had also previously noted that CFSGAM's unlisted infrastructure investments, where the New Zealand gas pipeline assets will sit, have delivered an annualised gross return of 13.2% across its portfolio since inception (over 20 years). MGUG stated that "[t]he addition of the New Zealand transmission assets to the portfolio is unlikely to have been done with the expectation of lowering the overall portfolio returns".[599]

761. Contact also submitted that it has a number of concerns regarding the implications of statements in First State Investments' submission for New Zealand regulated service consumers, and does not agree with the conclusion that the Commission

595 MGUG submission "Input methodologies – Draft decision" (4 August 2016), p. 7.
596 CFSGAM "CFSGAM managed funds to acquire 100% of Vector Gas Limited" (11 November 2015).
597 MGUG submission "Input methodologies – Draft decision" (4 August 2016), para 39; and MGUG "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), para 13-21.
598 MGUG submission "Input methodologies – Draft decision" (4 August 2016), para 40.
599 MGUG "Submission on cost of capital update paper: 30 November 2015" (5 February 2016), para 16.

(and ultimately consumers) "should be comfortable with Price/RAB ratios well in excess of 1.0x".[600] Contact submitted that:[601]

> While we agree it is difficult to see everything behind the drivers of such multiples, the FSI submission has raised a number of concerns that consumers are paying too much for these services and not benefiting from unregulated activities derived from these privileged monopoly positions. This is not an outcome that would be expected in competitive markets and we see it as not in line with Section 52(A)(1).

762. While we agree with First State Investments that RAB multiples in excess of 1 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 1 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 0.40) generates at least a normal rate of return.

763. Further, we disagree with First State Investments' suggestion that RAB multiples of less than 1.25x would raise concerns that our WACC estimate is "less than the minimum the market would expect".

763.1 In our 2014 WACC percentile decision, we referred to analysis based on a simplified discounted cash-flow model we built.[602] In a hypothetical example using this model, we estimated a RAB multiple of 1.16x based on the value generated by: using the 67th percentile WACC estimate rather than the mid-point, and the expectation that there will be an opex underspend of 11% pa into perpetuity.[603]

763.2 In this hypothetical example, approximately half of the 0.16 premium above RAB was due to the 67th percentile, and the other half was due to an assumed opex underspend of 11% pa into perpetuity. This suggests that if our mid-point WACC estimate exactly matched the firm's 'true' WACC, using the 67th percentile would be expected to lead to a RAB multiple of approximately 1.08x (other things being equal).

763.3 Assuming our mid-point WACC estimate exactly matches the actual WACC, RAB multiples either above or below 1.08x could be expected to the extent the regulated business under or over performs relative to opex and capex benchmarks.

763.4 Regarding the 1.16x example outlined above, we consider the assumption of a 11% pa opex underspend into perpetuity is unlikely to be achievable in

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600 Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 13.

601 Contact Energy "Input methodology review: Cost of capital cross submission" (25 August 2016), p. 15.

602 When the allowed WACC equals the required rate of return and when the regulator's allowed operating cash flows are in line with expected actual cash flows, the model calculates a RAB multiple of 1.0x.

603 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 C96-C100.

reality.[604] Contrary to First State Investments' submission, this indicates that RAB multiples significantly less than 1.25x should not raise concerns that our WACC estimate is too low.

764. We acknowledge that there are limitations of our RAB multiples analysis. For example, as noted in our 2014 WACC percentile decision:[605]

764.1 there are only a limited number of data points available;

764.2 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

764.3 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.

765. 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 754, 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.

766. In response to MGUG's submissions, we note that:

766.1 MGUG appears to be comparing First State Investments' target *return on equity* with WACC rates we have determined (which by definition, are a weighted average of the *cost of debt* and the *cost of equity*). The cost of equity is higher than the cost of debt as equity holders take more risk than debt holders, so it seems that MGUG is not making a like-for-like comparison.

766.2 The analysis of EDB investment levels referred to by MGUG suggests that the allowed rate of return we have set is at least sufficient to incentivise investment. However, MGUG has not provided any evidence to suggest that the observed investment levels reflect over-investment (such that the allowed rate of return should be reduced).

766.3 We understand total returns have fallen over the last two decades, and it is not clear that CFSGAM would expect to earn the same percentage returns on the Maui and Vector acquisitions as it has earned historically.

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604 This would require the regulated business to repeatedly reduce its operating expenditure by 11% pa, relative to its regulatory allowance. This seems unlikely, particularly given that opex savings are passed on to consumers when the price-quality paths are reset every five years.

605 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.

How we estimated the RAB multiples for Horizon and Maui

767. 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.[606]

768. Table 24 summarises our RAB multiples calculations for Horizon. We have estimated both standard and adjusted RAB multiples. The difference is that the adjusted calculation also includes other net financial obligations, such as deferred taxes, when calculating the enterprise value.

Table 24: Horizon RAB multiple

	Measurement date	RAB multiple (standard)	RAB multiple (adjusted for other net financial obligations)[607]
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

769. The RAB multiples we have estimated for Horizon are based on the assumptions set out below.

769.1 The price paid by Eastern Bay Energy Trust implies a value of $110.2m for 100% of Horizon's equity.[608]

769.2 Horizon had net debt of $44.3m as at March 2015.[609]

606 The source documents are listed in footnotes 588 and 589. Given that Horizon and Maui are not publicly listed, no broker RAB multiples estimates are available for these companies.

607 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.

608 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.

609 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.

769.3 Horizon had other net financial obligations of $24.0m as at March 2015.[610]

769.4 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).[611]

769.5 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).

769.6 Horizon's closing RAB as at March 2015 is $113.3m.[612]

770. Table 25 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.[613]

Table 25: Maui RAB multiple

	Measurement date	RAB multiple (standard)
Enterprise value of regulated utility ($m)		
Enterprise value based on sale price	Dec 2015	335.0
Less: capital work in progress	Dec 2015	3.1
Total		331.9
RAB ($m)	Dec 2015	284.5
EV / RAB		**1.17x**

Source: Publicly available information and Commerce Commission analysis

771. The RAB multiple we have estimated for Maui is based on the assumptions set out below.

771.1 The sale price of $335m is used as the enterprise value for the regulated business.[614] We have assumed there are no unregulated businesses to be subtracted.

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610 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.

611 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.

612 Horizon "Information Disclosure Reports prepared according to Part 4 of the Commerce Act 1986 For the Year Ended 31 March 2015".

613 We understand that Maui is a joint venture, so only consists of operating assets.

614 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.

771.2 We have removed capital works in progress of $3.1m from the enterprise value, given that RAB values do not include capital work in progress (ie, assets are only included in RAB once they are commissioned).

771.3 Maui's closing RAB as at December 2015 was $284.5m. We have updated the RAB value used between the draft IM review decision and this final decision, because updated disclosures for Maui (as at 30 June 2016) are now available.[615]

Black's simple discounting rule

772. 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

773. The current CAPM methodology is known to have limitations in estimating the appropriate risk-adjusted return.[616] IWA (on behalf of MEUG) therefore 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.[617]

774. 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

775. Frontier (on behalf of Transpower) explains how BSDR values an asset by estimating future 'certainty equivalent' cash-flows and discounting them using a risk-free rate.[618] 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.

776. 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.

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615 Maui Development Limited, information disclosure templates as at 30 June 2016.

616 See paragraphs 644 to 659 above for further discussion.

617 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).

618 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.

777. 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.

778. 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 usefulness as a cross-check on the WACC depends on the accuracy of estimating the certainty equivalent cash-flows (compared to the WACC).

779. The suggested approach for estimating these cash-flows is a 4-step process described by IWA in reference to a paper by Loderer.[619] Broadly speaking this process can be described as:

779.1 find a benchmark security or index that closely correlates with the project's cash-flows;[620]

779.2 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;

779.3 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

779.4 discount those cash-flows at the risk-free rate.

780. 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.

[619] Loderer, Long, and Roth "Black's simple discounting tool" (August 2008).

[620] The overall market return appears to be the most suitable option for this benchmark. The IWA submission does not provide any potential alternatives.

Assessment of Black's simple discounting rule

781. We commissioned advice from Dr Lally on this topic.[621] 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:[622]

781.1 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.

781.2 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.

781.3 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.

782. Given these drawbacks Dr Lally does not recommend the use of this approach.

783. Submissions from suppliers provided a similar view to Dr Lally. The ENA summarise their position as:[623]

> 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.

621 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.

622 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.

623 ENA "Input methodologies review: Emerging views papers – Submission to the Commerce Commission" (24 March 2016), p. 8

784. 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:[624]

> 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.

785. IWA do not expand on how it expected the results could be used as a cross-check to the WACC. It submitted that the unconditional (or expected) cash-flows can be compared with the conditional (or certainty equivalent) cash-flows:[625]

> 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.

786. Both Houston Kemp and CEG suggested that when the certainty equivalent cash-flows are much lower than the expected cash-flows, it implies that a higher WACC is required. CEG submitted "The lower the certainty equivalent value as a proportion of the risky cash-flow implies the cash-flow is more risky, not less."[626]

787. 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.[627]

788. Houston Kemp and CEG suggested 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 suggested that if all of the same assumptions were retained, the difference of $58m would *decrease*, when a higher WACC is applied.[628]

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624 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.

625 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.

626 CEG "Use of Black's simple discount rule in regulatory proceedings" (report prepared for ENA, February 2016), para 72.

627 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.

628 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;

789. 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 a lower WACC changed the relationship between the expected cash-flow and pessimistic case, or there was a change to the expected cash-flow distribution, 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.

Decision on Black's Simple Discounting Rule

790. 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 the following.

    790.1 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, decreases in the WACC appear to increase the difference between the values of the two types of cash-flow.

    790.2 Determining a robust process for estimating the input parameters, and particularly the probability distribution of future cash-flows. We have limited data 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.

791. 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.[629] 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.

792. 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.

CEG "Use of Black's simple discount rule in regulatory proceedings" (report prepared for ENA, February 2016), para 72 and 78.

629 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).

793. Particular difficulties for its use in a regulatory context include limited experience/precedent and the difficulties described in estimating the probability distribution of expected cash-flows. We have limited empirical information to help inform us on this or the 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.

794. The approach 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.

795. 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.

796. However, even if we had more information that provided further evidence that this proposition was true, this would need to reconciled with evidence that empirical estimates of asset beta from comparable regulated firms consistently show a positive value for asset beta.

797. Therefore, we agree with Dr Lally's conclusion. We have decided not to use BSDR as a cross-check on the WACC until some of the identified issues have been resolved.

798. 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.

799. In response to the draft decision MEUG also agreed that it was not appropriate to use the BSDR as a cross-check on the WACC at this stage:[630]

> The draft decision concludes "We do not propose to use the BSDR as a cross-check on the WACC until some of the identified issues have been resolved." MEUG agrees. In our earlier submissions MEUG pointed out that there were aspects of BSDR that needed to be resolved before it could be considered as a tool for cross-checking CAPM derived cost of capital.

800. MEUG noted however, that it considered further research on the BSDR (as well as the SBL-CAPM and optimal percentile) is warranted and the Commission should start

[630] MEUG "Submission on Input methodologies draft review decisions" (4 August 2016), para 33.

such research in preparation for the next review. It also questioned why further academic research was not commissioned on the BSDR as part of this IM review.[631]

801. In response to MEUG's submission, we note that there is always a trade-off between the amount of research undertaken in different areas and the resources available to us. As part of this trade-off we focus areas of research in areas which we consider have the potential to have the largest impact on long-term benefits to consumers.

802. With regards to the current IM review, we commissioned an expert report on the potential for using BSDR in the context of regulation and provided a number of consultation periods in which stakeholders were free to provide further evidence for consideration.[632]

803. After reviewing the evidence before us, we decided against undertaking further research on the BSDR as we considered it would not provide any further benefit in the context of the current review. This is because it would require significant further work for us to have confidence in using the approach, given the lack of academic scrutiny on the BSDR methodology in the context of regulation, and because we would need to reconcile the approach with the empirical evidence of positive asset betas for regulated businesses. We decided a greater focus should be made on determining appropriate empirical estimates of inputs required for the SBL-CAPM (eg, asset beta).

804. However, we do note MEUG's suggestion of commencing further academic research on particular topics prior to the next review and this will be considered as part of our ongoing evaluation of the appropriate return for regulated suppliers.

631 MEUG "Submission on Input methodologies draft review decisions" (4 August 2016), para 33-37.

632 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), Chapter 3.

Chapter 8: Application of WACC

Purpose of this chapter

805. The purpose of this chapter is to address issues that have been identified with the application of our WACC estimates. These issues are:

805.1 the timing of the determination and publication of our WACC estimates for airports given the differences between *ex-ante* profitability assessment following an airport's price setting event and *ex-post* profitability assessment;

805.2 the timing of our amendments to WACC made as part of the IM review; and

805.3 the requirement to publish a specific WACC for CPPs.

Airport WACC timing

806. We have decided to publish quarterly WACC estimates for airports, when requested, for the use in an *ex-ante* profitability assessment under ID regulation.[633]

807. 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.

808. 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.

809. We currently estimate and publish annual WACC estimates for airports' ID purposes, in April for Wellington Airport and July for Auckland Airport and Christchurch Airport. We publish these WACC estimates within one month of the start of the disclosure period.

810. 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.

811. 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.

633 We will consider the implementation of this decision in annual historic disclosures in a future process.

812. Therefore, we have decided 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 airport's price setting event) in assessing profitability. When airports plan to reset their prices they can 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. We will also publish any WACC estimate that corresponds to a price setting event, in any circumstance in which it has not already been published on request from an airport.

813. 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 (or following a price setting event), so that we are not unnecessarily increasing regulatory costs.

814. In response to our draft decision, BARNZ requested that we should:[634]

> Expand the ability to request the Commission to prepare and release a WACC estimate so that substantial customers of an airport can make such a request.

815. We have considered the request from BARNZ but do not think it is appropriate as it will add to the complication of the IMs but with limited benefit. For example, we would have to define a 'substantial customer' and could potentially increase the number of WACC estimates we would need to publish.

816. We also note that:

816.1 any interested party could use the WACC IMs to estimate a WACC separately from any publication by us; and

816.2 any WACC associated with a specific airport price setting event will be published.

When will our proposed changes to how we estimate WACC be incorporated in ID regulation?

817. 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):

817.1 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;

634 Letter from John Beckett (Executive Director, BARNZ) to Keston Ruxton (Manager, Commerce Commission) re the BARNZ technical drafting comments on [DRAFT] Amendment to the Commerce Act (Specified Airport Services Input Methodologies) Determination 2010" (18 August 2016), p. 1.

817.2 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;

817.3 for CPPs, for CPP applications made following the date our final GDB, GTB and EDB IM determination amendments are published; and

817.4 for the Transpower IPP, for the next IPP reset after the date of publication of our final IM determination amendments.

CPP/DPP dual WACC

818. We have decided 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 have removed the clauses describing the detailed determination of a CPP WACC from the cost of capital IM for EDBs, GDBs, and GTBs.

Attachment A: Further details regarding energy asset beta and leverage comparator sample

Purpose of this attachment

819. This attachment includes further details regarding the sample of comparator firms used when estimating asset betas for EDBs, Transpower and GPBs. It includes details of the full list of 74 companies included in our draft decision published on 16 June 2016 (ie, the two companies we have subsequently excluded from the sample – Jersey Electricity and National Fuel Gas Company – are included in this attachment).

820. Specifically:

820.1 Table 26 lists changes in the asset beta comparator sample used in the draft IM review decision, compared to the 2010 IMs decision. It shows the:

820.1.1 15 companies included in the 2010 sample that are not included in our new sample because of acquisitions or de-listings (in red); and

820.1.2 10 new firms that have been added (in green).

820.2 Table 27 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.

820.3 Table 28 summarises the asset beta results for our energy comparator sample across the four separate five-year periods we have considered, based on daily, weekly and four-weekly frequencies.

820.4 Table 29 summarises leverage for each of the companies in the energy comparator sample, across the four separate five-year periods we have considered.

Table 26: 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. ***Note:** Jersey Electricity has been removed from the final comparator sample as discussed in paragraph 284.1 above.*
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.

Table 27: 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
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

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
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
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

Ticker	Name	Bloomberg description	Electricity/Gas/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
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

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
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
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

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
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
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

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
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
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

Ticker	Name	Bloomberg description	Electricity/Gas/Integrated
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
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

Ticker	Name	Bloomberg description	Electricity/Gas/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 28: Asset beta results for energy comparator sample

Ticker	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	0.11	0.08	0.03	0.28	0.27	0.25	0.41	0.41	0.42	0.36	0.32	0.26
AEP US Equity	0.14	0.09	-0.04	0.39	0.42	0.54	0.35	0.33	0.31	0.32	0.29	0.21
AES US Equity	0.42	0.55	0.75	0.41	0.47	0.64	0.52	0.51	0.56	0.37	0.40	0.37
ALE US Equity	0.15	0.09	0.02	0.52	0.56	0.56	0.47	0.46	0.51	0.43	0.40	0.40
APA AU Equity	0.15	0.01	0.01	0.21	0.19	0.25	0.27	0.22	0.25	0.39	0.31	0.33
AST AU Equity	-	-	-	-	-	-	0.16	0.09	0.09	0.24	0.25	0.27
ATO US Equity	0.19	0.17	0.14	0.35	0.29	0.25	0.30	0.31	0.32	0.44	0.39	0.31
AVA US Equity	0.17	0.11	0.16	0.34	0.33	0.36	0.34	0.33	0.36	0.39	0.35	0.30
BKH US Equity	0.24	0.09	-0.09	0.37	0.47	0.58	0.52	0.50	0.59	0.50	0.43	0.47
BWP US Equity	-	-	-	0.35	0.01	0.00	0.39	0.46	0.26	0.42	0.43	0.52
CMS US Equity	0.08	0.05	0.13	0.24	0.30	0.47	0.26	0.25	0.24	0.30	0.26	0.18
CNL US Equity	0.19	0.14	0.09	0.41	0.47	0.62	0.47	0.39	0.37	0.41	0.39	0.28
CNP US Equity	0.14	0.10	0.04	0.18	0.27	0.40	0.27	0.30	0.28	0.41	0.39	0.30
CPK US Equity	0.03	0.01	0.02	0.09	0.12	0.20	0.54	0.50	0.37	0.54	0.33	0.27
D US Equity	0.11	0.08	0.03	0.31	0.29	0.33	0.38	0.36	0.31	0.33	0.29	0.17
DGAS US Equity	0.02	0.03	0.01	0.00	0.04	0.08	0.12	0.21	0.25	0.25	0.27	0.32
DTE US Equity	0.16	0.10	0.03	0.22	0.18	0.21	0.33	0.33	0.33	0.36	0.32	0.23
DUE AU Equity	-	-	-	0.11	0.01	0.01	0.14	0.14	0.16	0.14	0.12	0.13
DUK US Equity	0.18	0.12	-0.01	0.44	0.57	0.71	0.37	0.34	0.31	0.26	0.21	0.13
ED US Equity	0.17	0.13	0.09	0.26	0.21	0.17	0.28	0.27	0.23	0.24	0.17	0.06
EDE US Equity	0.07	0.07	0.04	0.29	0.27	0.32	0.35	0.33	0.36	0.38	0.30	0.22
EE US Equity	0.14	0.12	0.15	0.36	0.28	0.26	0.44	0.41	0.45	0.37	0.33	0.27
EEP US Equity	0.16	0.18	0.08	0.16	0.21	0.06	0.40	0.52	0.51	0.49	0.57	0.62
EIX US Equity	0.14	0.11	0.04	0.34	0.31	0.31	0.48	0.47	0.44	0.32	0.29	0.26
ES US Equity	0.07	0.08	0.16	0.18	0.19	0.17	0.30	0.30	0.28	0.36	0.32	0.25
ETR US Equity	0.09	0.06	0.02	0.27	0.30	0.35	0.44	0.39	0.39	0.28	0.25	0.22
EXC US Equity	0.11	0.06	-0.08	0.31	0.27	0.36	0.66	0.61	0.51	0.35	0.29	0.18
FE US Equity	0.12	0.03	0.00	0.25	0.21	0.24	0.42	0.39	0.34	0.27	0.22	0.12
GAS US Equity	0.18	0.18	0.17	0.35	0.35	0.36	0.36	0.38	0.33	0.31	0.26	0.12
GXP US Equity	0.12	0.13	0.17	0.28	0.35	0.40	0.32	0.35	0.44	0.32	0.32	0.30
HE US Equity	0.24	0.16	0.07	0.41	0.41	0.43	0.39	0.46	0.45	0.50	0.46	0.37
IDA US Equity	0.18	0.14	0.05	0.30	0.36	0.42	0.35	0.33	0.29	0.45	0.39	0.38

Ticker	1996 - 2001			2001 - 2006			2006 - 2011			2011 - 2016		
	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly
ITC US Equity	-	-	-	0.49	0.02	0.02	0.43	0.47	0.49	0.32	0.28	0.19
JEL LN Equity	-	-	-	0.00	0.02	0.04	0.00	-0.01	-0.09	0.01	0.04	0.02
KMI US Equity	-	-	-	-	-	-	-	-	-	0.53	0.60	0.56
SR US Equity	0.16	0.15	0.08	0.40	0.35	0.29	0.44	0.34	0.14	0.44	0.34	0.30
LNT US Equity	0.12	0.09	0.04	0.29	0.31	0.27	0.48	0.48	0.43	0.42	0.38	0.31
MGEE US Equity	0.23	0.12	0.05	0.62	0.41	0.33	0.48	0.38	0.27	0.59	0.40	0.31
NEE US Equity	0.13	0.06	-0.03	0.30	0.29	0.28	0.44	0.41	0.36	0.33	0.31	0.25
NFG US Equity	0.20	0.18	0.08	0.30	0.36	0.40	0.75	0.76	0.76	0.80	0.89	0.79
NG/ LN Equity	0.51	0.52	0.47	0.28	0.24	0.30	0.32	0.29	0.27	0.31	0.27	0.26
NI US Equity	0.08	0.05	0.01	0.26	0.25	0.31	0.33	0.34	0.36	0.37	0.36	0.22
NJR US Equity	0.16	0.12	0.09	0.40	0.37	0.26	0.48	0.42	0.28	0.59	0.46	0.35
NWE US Equity	-	-	-	0.19	0.02	0.02	0.36	0.36	0.38	0.40	0.33	0.30
NWN US Equity	0.20	0.14	0.08	0.34	0.29	0.19	0.42	0.34	0.22	0.39	0.30	0.24
OGE US Equity	0.14	0.08	0.05	0.28	0.24	0.26	0.50	0.48	0.50	0.54	0.55	0.46
OKE US Equity	0.27	0.23	0.15	0.33	0.37	0.36	0.49	0.50	0.56	0.66	0.73	0.58
PCG US Equity	0.11	0.07	0.05	0.51	0.47	0.54	0.36	0.28	0.27	0.30	0.25	0.27
PEG US Equity	0.12	0.09	0.00	0.27	0.29	0.36	0.54	0.46	0.41	0.44	0.39	0.23
PNM US Equity	0.12	0.10	0.06	0.37	0.40	0.60	0.38	0.42	0.43	0.38	0.32	0.28
PNW US Equity	0.07	0.03	-0.04	0.33	0.38	0.49	0.33	0.34	0.33	0.39	0.36	0.29
PNY US Equity	0.20	0.19	0.10	0.41	0.40	0.35	0.49	0.41	0.25	0.50	0.44	0.45
POM US Equity	-	-	-	0.23	0.12	0.14	0.34	0.37	0.34	0.24	0.22	0.19
PPL US Equity	0.14	0.11	0.00	0.33	0.36	0.51	0.49	0.41	0.34	0.26	0.24	0.19
SCG US Equity	0.14	0.06	-0.03	0.26	0.27	0.29	0.34	0.31	0.33	0.32	0.28	0.25
SE US Equity	-	-	-	-	-	-	0.61	0.59	0.61	0.56	0.56	0.45
SJI US Equity	0.09	0.07	0.08	0.25	0.23	0.22	0.46	0.38	0.27	0.53	0.45	0.43
SKI AU Equity	-	-	-	-	-	-	0.28	0.23	0.21	0.39	0.30	0.19
SO US Equity	0.13	0.02	-0.04	0.26	0.15	0.10	0.30	0.24	0.22	0.23	0.19	0.09
SRE US Equity	0.10	-0.01	-0.12	0.42	0.47	0.56	0.54	0.54	0.52	0.43	0.41	0.38
SSE LN Equity	0.24	0.14	0.17	0.36	0.29	0.31	0.47	0.43	0.36	0.45	0.44	0.42
STR US Equity	0.21	0.20	0.13	0.43	0.52	0.63	1.09	1.08	0.90	0.52	0.50	0.32
SWX US Equity	0.17	0.16	0.22	0.28	0.26	0.22	0.43	0.41	0.40	0.50	0.40	0.38
TCP US Equity	0.14	0.05	-0.04	0.17	0.27	0.16	0.33	0.46	0.52	0.45	0.58	0.60
TE US Equity	0.12	0.05	-0.05	0.29	0.34	0.39	0.42	0.40	0.42	0.39	0.37	0.21
UGI US Equity	0.17	0.15	0.07	0.29	0.31	0.24	0.37	0.34	0.29	0.47	0.49	0.44

Ticker	1996 - 2001			2001 - 2006			2006 - 2011			2011 - 2016		
	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly	Daily	Weekly	4-Weekly
UTL US Equity	0.06	0.08	0.20	0.03	0.04	0.03	0.09	0.12	0.15	0.34	0.21	0.15
VCT NZ Equity				0.43	0.08	0.04	0.24	0.21	0.28	0.25	0.20	0.19
VVC US Equity	0.44	0.08	0.01	0.32	0.33	0.31	0.34	0.33	0.29	0.43	0.39	0.39
WEC US Equity	0.13	0.09	0.03	0.20	0.21	0.19	0.29	0.27	0.25	0.35	0.28	0.15
WGL US Equity	0.28	0.22	0.13	0.43	0.37	0.30	0.49	0.39	0.26	0.56	0.45	0.39
WPZ US Equity	-	-	-	-	-	-	-	-	-	0.60	0.86	0.82
WR US Equity	0.07	0.03	-0.04	0.25	0.25	0.25	0.36	0.36	0.33	0.33	0.30	0.26
XEL US Equity	0.16	0.10	0.03	0.31	0.27	0.48	0.31	0.26	0.25	0.30	0.24	0.17
Average*	0.16	0.11	0.07	0.30	0.28	0.31	0.40	0.38	0.35	0.39	0.36	0.30

***Note:** The averages presented above include JEL LN Equity and NFG US Equity, which have been removed from the refined sample used in this final decision (for the reasons explained in paragraph 284 above).

Table 29: Leverage results for energy comparator sample

Ticker	1996 - 2001	2001 - 2006	2006 - 2011	2011 - 2016
AEE US Equity	33%	36%	47%	44%
AEP US Equity	46%	50%	50%	45%
AES US Equity	38%	72%	60%	67%
ALE US Equity	34%	23%	26%	35%
APA AU Equity	54%	52%	61%	46%
AST AU Equity	-	-	61%	58%
ATO US Equity	38%	43%	47%	39%
AVA US Equity	41%	56%	50%	44%
BKH US Equity	27%	42%	42%	44%
BWP US Equity	-	32%	33%	40%
CMS US Equity	59%	77%	65%	51%
CNL US Equity	40%	45%	36%	32%
CNP US Equity	49%	69%	64%	47%
CPK US Equity	34%	37%	33%	26%
D US Equity	50%	45%	41%	39%
DGAS US Equity	58%	51%	44%	26%
DTE US Equity	47%	54%	54%	42%
DUE AU Equity	-	79%	76%	67%
DUK US Equity	28%	44%	37%	44%
ED US Equity	36%	41%	44%	40%
EDE US Equity	43%	46%	48%	44%
EE US Equity	64%	46%	43%	42%
EEP US Equity	32%	35%	41%	36%
EIX US Equity	54%	62%	40%	42%
ES US Equity	64%	63%	52%	41%
ETR US Equity	53%	41%	37%	50%
EXC US Equity	40%	40%	24%	38%
FE US Equity	53%	50%	45%	55%
GAS US Equity	40%	44%	44%	44%
GXP US Equity	37%	42%	48%	53%
HE US Equity	0%	4%	24%	25%
IDA US Equity	39%	48%	47%	39%
ITC US Equity	-	34%	45%	42%
JEL LN Equity	-	0%	0%	0%
KMI US Equity	-	-	-	42%
SR US Equity	39%	46%	38%	34%
LNT US Equity	43%	50%	32%	37%
MGEE US Equity	31%	29%	31%	21%
NEE US Equity	26%	40%	41%	44%
NFG US Equity	37%	40%	21%	23%
NG/ LN Equity	20%	47%	50%	44%
NI US Equity	43%	56%	58%	48%
NJR US Equity	36%	32%	27%	27%

Ticker	1996 - 2001	2001 - 2006	2006 - 2011	2011 - 2016
NWE US Equity	-	41%	44%	42%
NWN US Equity	40%	40%	36%	40%
OGE US Equity	40%	46%	38%	33%
OKE US Equity	42%	56%	52%	43%
PCG US Equity	50%	45%	39%	41%
PEG US Equity	47%	56%	35%	31%
PNM US Equity	50%	47%	61%	51%
PNW US Equity	44%	46%	48%	37%
PNY US Equity	32%	31%	34%	35%
POM US Equity	-	62%	56%	51%
PPL US Equity	48%	47%	33%	50%
SCG US Equity	42%	47%	47%	46%
SE US Equity	-	-	41%	39%
SJI US Equity	47%	42%	31%	36%
SKI AU Equity	-	-	53%	29%
SO US Equity	43%	37%	39%	37%
SRE US Equity	38%	39%	31%	38%
SSE LN Equity	9%	18%	24%	29%
STR US Equity	30%	28%	18%	27%
SWX US Equity	58%	60%	49%	37%
TCP US Equity	3%	2%	29%	27%
TE US Equity	35%	55%	50%	43%
UGI US Equity	56%	49%	40%	41%
UTL US Equity	46%	50%	55%	46%
VCT NZ Equity	-	54%	56%	48%
VVC US Equity	43%	43%	45%	39%
WEC US Equity	43%	54%	44%	37%
WGL US Equity	32%	35%	32%	28%
WPZ US Equity	-	-	-	26%
WR US Equity	59%	62%	51%	45%
XEL US Equity	43%	56%	47%	44%
Average*	41%	45%	43%	40%

***Note:** The averages presented above include JEL LN Equity and NFG US Equity, which have been removed from the refined sample used in this final decision (for the reasons explained in paragraph 284 above).

Attachment B: Alternative approaches to energy comparator sample analysis

Purpose of this attachment

821. This attachment includes further details regarding alternative approaches to the energy comparator sample analysis, which we considered when reaching our decision.

822. We considered three main alternative approaches:

822.1 Oxera's refined sample, after applying its suggested liquidity and gearing filters;

822.2 TDB's three step approach to refining the sample; and

822.3 using TRBC as a cross-check, as suggested in First Gas' cross submission.

823. These three approaches are outlined in more detail below. Figure 16 to Figure 18 summarise the results under each approach, relative to the comparator samples used in our draft decision and this final decision.

824. For each approach, we have reported the results for the full energy sample, as well as separate electricity, gas, and integrated sub-samples. Oxera's submission on the draft decision suggested separate electricity and gas sub-samples when determining asset betas.[635]

825. The results presented in this attachment differ slightly from those in the Oxera, First Gas and TDB submissions, due to differences in frequencies and time periods used when averaging the results. The graphs below are presented on a like-for-like basis, using the amended asset betas after correcting the spreadsheet errors identified in our draft decision.

Oxera's refined energy sample

826. In response to our draft decision, Oxera submitted that seven companies should be excluded from the energy sample, by applying additional liquidity and gearing filters.

827. Specifically, Oxera recommended that:[636]

827.1 Jersey Electricity be excluded because it has a low proportion of days traded;

827.2 AusNet Services, Boardwalk Pipeline Partners LP, Vector Ltd and Williams Partners LP should be excluded based on a low free float percentage;

[635] Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 2.

[636] Oxera (report prepared for First Gas) "Asset beta for gas pipelines in New Zealand" (3 August 2016), p. 14-17

827.3 Delta Natural Gas Co should be excluded due to a high average bid-ask spread percentage; and

827.4 AES Corp should be excluded due to high average gearing.

828. Although we have applied the percentage of days traded liquidity filter when determining the final comparator sample, we disagree with the other filters suggested by Oxera. Our reasons are explained in paragraph 285 above.

TDB refinements to the energy sample

829. TDB noted that selecting an appropriate comparator sample involves making a trade-off between the comparability of the set with the regulated entities, and the statistical significance of the sample set. TDB considered that "…the Commission may have adopted too large a set at the expense of a loss in accuracy in the appropriate asset beta".[637]

830. TDB proposed three steps to refining the sample of 74 companies used in our draft decision:

830.1 **Step 1:** exclude 20 companies assessed as having higher systematic risk, largely through unregulated gas gathering, processing, liquids and commodity exposures not found in "pure-play" distribution or transmission.

830.2 **Step 2:** exclude another 14 companies with material lines of business with higher systematic risk that are either unrelated to the NZ regulated services (as they involve non-energy activities), or have energy revenues that are unregulated.

830.3 **Step 3:** exclude another 31 companies with energy activities that are regulated, but are engaged in activities outside the transport of electricity and gas (these companies are mostly generators, retailers, and transporters of electricity).

831. Further discussion of TDB's approach to refining the sample is included in paragraphs 309 to 320 above.

Thomson Reuters Business Classifications

832. In its cross submission, First Gas disagreed with Contact's view that "Bloomberg descriptions are too prone to error and do not provide enough information to form a view of how comparable the company's operations are relative to the service being regulated". First Gas noted that:[638]

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637 TBD Advisory Limited (report prepared for Contact Energy) "Submission to the Commerce Commission on the input methodologies review draft decisions: Comparative company analysis" (4 August 2016), p. 5.

638 [PUBLIC] First Gas "Cross submission on input methodologies review draft decisions: Cost of capital issues" (25 August 2016), p. 5.

832.1 Bloomberg is an internationally recognised, widely used financial service provider; and

832.2 neither Contact nor TDB demonstrate why Bloomberg classifications are prone to error, and why their proposed filters lead to more reliable classifications.

833. Although First Gas considered Bloomberg classifications fit for purpose, it noted that TRBC could be used as an alternative. First Gas asked Oxera to update its asset beta estimates using TRBC, noting that:[639]

> The purpose of this analysis is not to suggest the Commission adopt the TRBC system – but rather to test whether using a classification system with different screens than Bloomberg materially changes the result.
>
> In order to refine the Commission's sample Oxera had already applied liquidity and gearing filters as described in its expert report. In addition, Oxera has now excluded five companies (namely, Kinder Morgan, Enbridge Energy, ONEOK, Spectra Energy, and TC Pipelines) from the gas sub-sample and the whole energy sample, as these were not classified as "natural gas utilities" under TRBC. This approach leads to the exclusion of five out of the six gas companies that are identified by TDB as outliers and therefore appears to objectively address concerns raised by Contact Energy, while maintaining transparency.

834. First Gas concluded that "[t]he results for the refined comparator sample show that the beta for gas companies, after excluding gas companies that are not classified as "natural gas utilities", remains considerably higher than that for the electricity companies in the whole 'energy' sample".[640]

835. In its analysis, Oxera appears to have limited the gas sub-sample to those companies which were both: (i) included its refined comparator sample (as discussed in paragraphs 826 to 828 above), and (ii) classified as "Natural Gas Utilities" under TRBC. However, the electricity and integrated sub-samples continued to be based on the Bloomberg classifications, rather than TRBC.

836. We have adopted a slightly different approach to Oxera in our analysis of TRBC, because we have used Thomson Reuters classifications to determine the electricity and integrated sub-samples, as well as the gas sub-sample. Specifically, we have separated the 74 companies used in our draft decision based on the classifications in Table 30 below.[641]

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639 [PUBLIC] First Gas "Cross submission on input methodologies review draft decisions: Cost of capital issues" (25 August 2016), p. 6.

640 [PUBLIC] First Gas "Cross submission on input methodologies review draft decisions: Cost of capital issues" (25 August 2016), p. 6.

641 Companies classified as 'Oil & Gas Related Equipment and Services' have been excluded in our analysis using TRBC.

Table 30: TRBC approach to separating the energy comparator sample

Sample	TRBC industry group	# of companies
Electricity sample	'Electric Utilities & IPPs'	39
Gas sample	'Natural Gas Utilities'	15
Integrated sample	'Multiline Utilities'	11
Energy sample	'Electric Utilities & IPPs', 'Natural Gas Utilities', and 'Multiline Utilities'	66

837. As shown in Figure 17 below, when averaged across weekly and four-weekly asset betas for 2006-2011 and 2011-2016, our analysis of the TRBC approach leads to:

837.1 a 0.06 difference between the gas sub-sample and the whole energy sample (compared with 0.08 in Oxera's analysis);[642] and

837.2 a 0.09 difference between the gas sub-sample and the electricity sub-sample (compared with 0.08 in Oxera's analysis).[643]

Summary of results from alternative approaches to energy comparator sample

838. The graphs below summarise the results under each of the approaches to determining the energy comparator sample we have considered. Specifically:

838.1 Figure 16 shows the number of firms included in each comparator sample;

838.2 Figure 17 shows the asset beta for each approach, averaged across weekly and four-weekly estimates for 2006-2011 and 2011-2016; and

838.3 Figure 18 shows the average leverage for each approach, averaged across 2006-2011 and 2011-2016.

642 [PUBLIC] First Gas "Cross submission on input methodologies review draft decisions: Cost of capital issues" (25 August 2016), table 1, p. 6.

643 [PUBLIC] First Gas "Cross submission on input methodologies review draft decisions: Cost of capital issues" (25 August 2016), table 1, p. 6.

Figure 16: Number of firms in each comparator sample

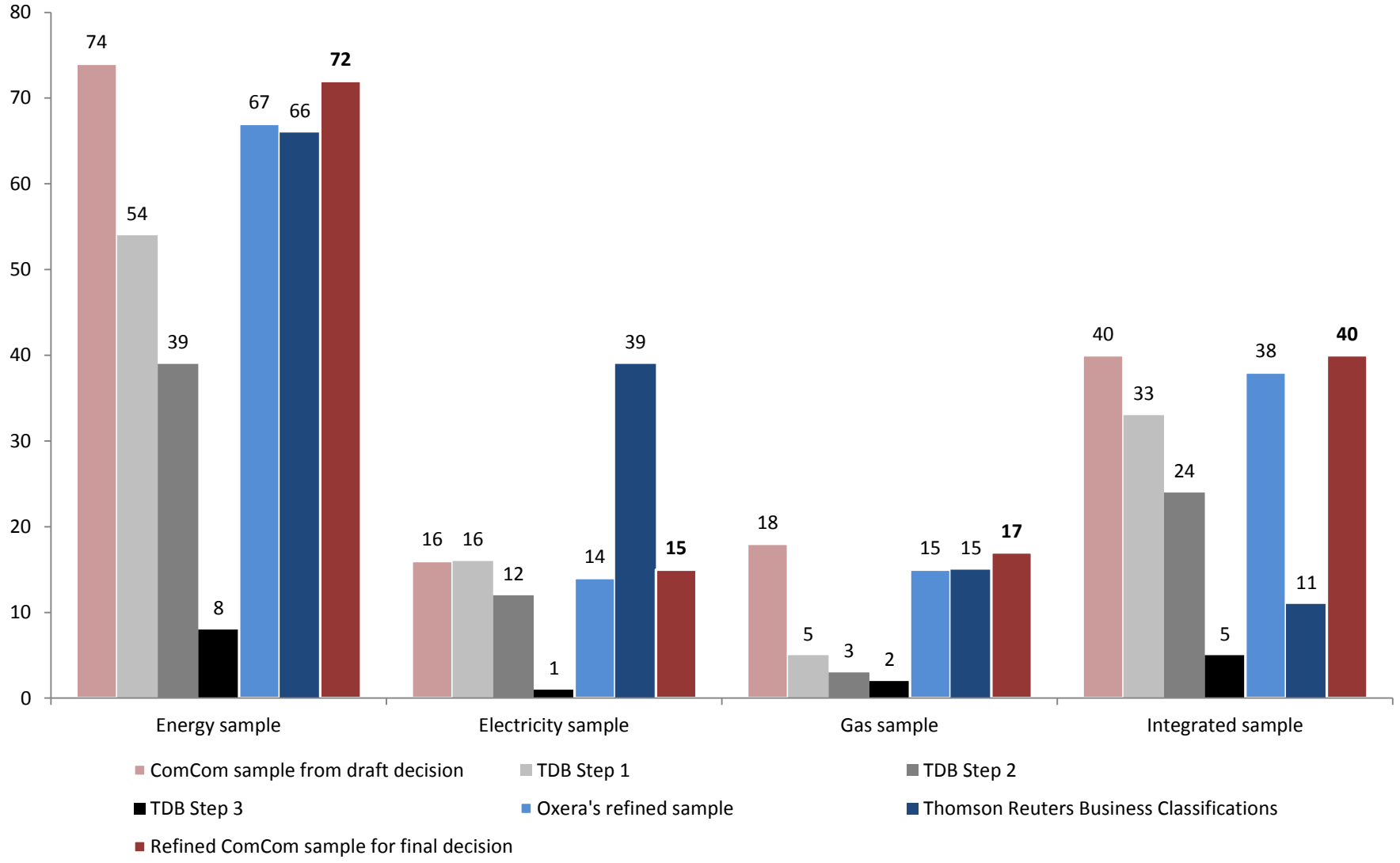


Figure 17: Asset beta estimates (averaged across weekly and four-weekly, for 2006-2011 and 2011-2016)

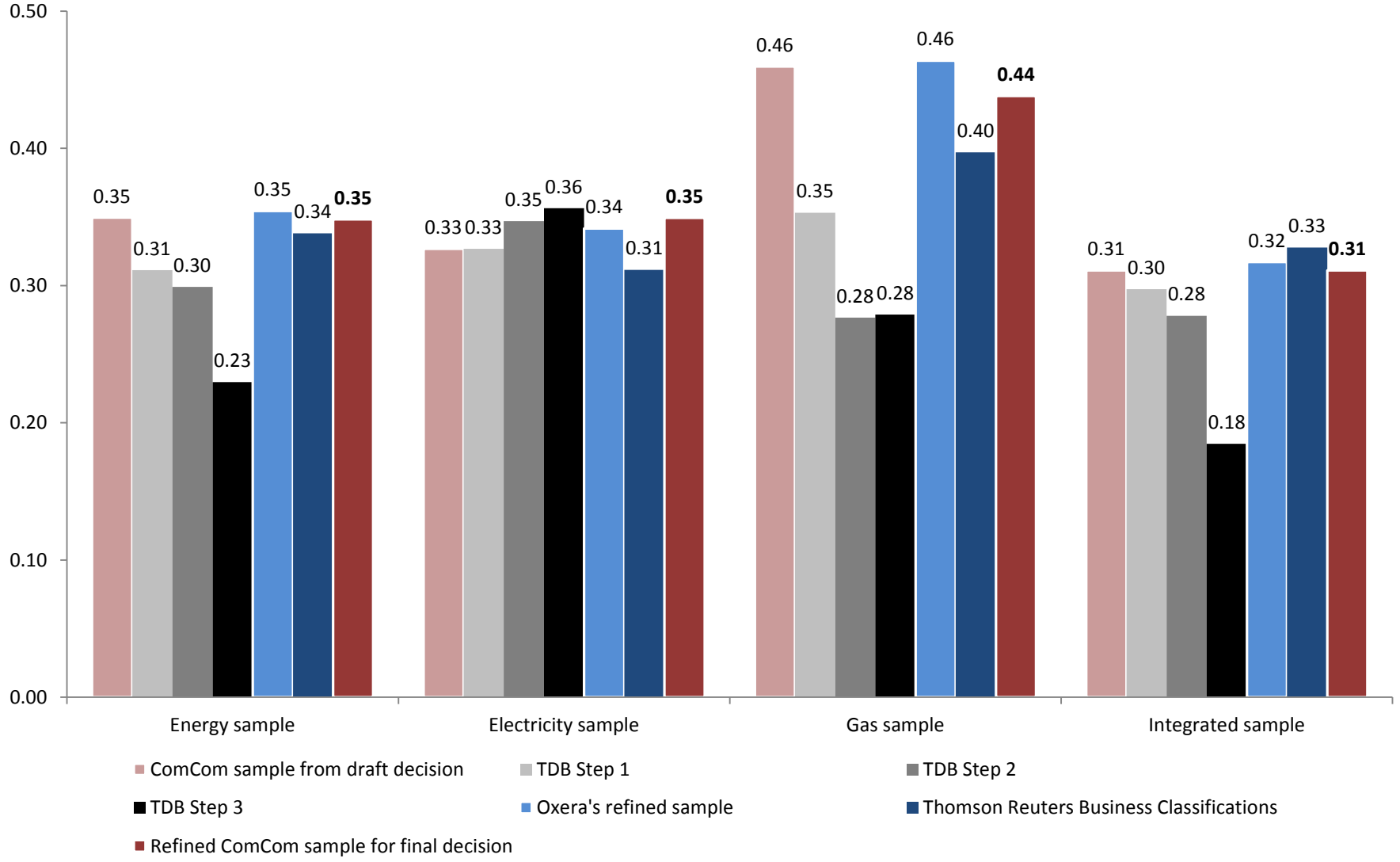
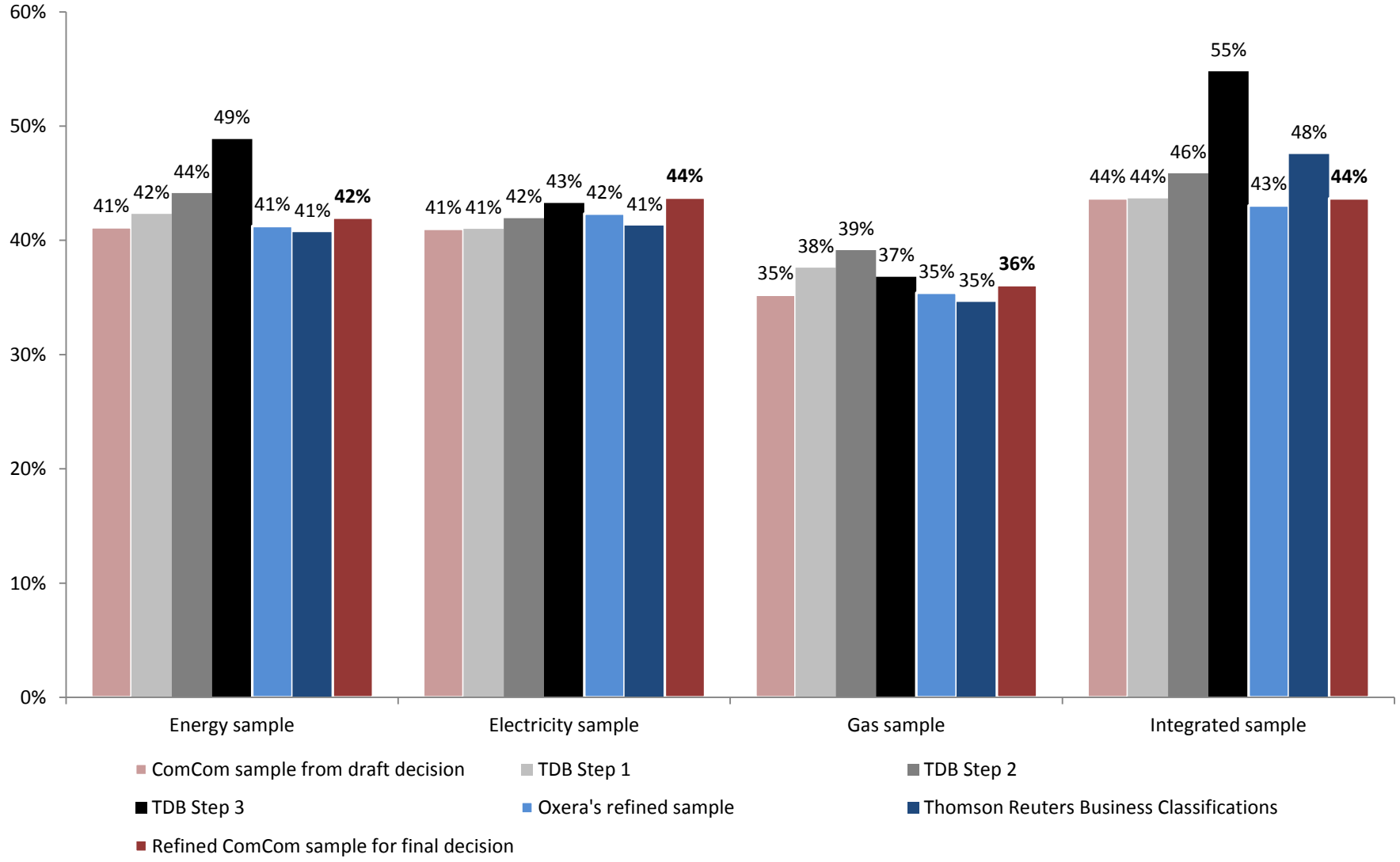


Figure 18: Leverage estimates (averaged across 2006-2011 and 2011-2016)



Attachment C: Further details regarding airports asset beta and leverage comparator sample

Purpose of this attachment

839. This attachment includes further details regarding the sample of comparator firms used when estimating the asset beta for airports. Specifically:

839.1 Table 31 lists changes in the asset beta comparator sample used in this IM review decision, compared to the 2010 IMs decision. It shows the:

839.1.1 four companies from the 2010 sample that are no longer included primarily because of acquisitions or de-listings (in red); and

839.1.2 five new firms that have been added (in green).

839.2 Table 32 lists the 26 firms included in our airports comparator sample, including descriptions for each company reported by Bloomberg; and

839.3 Table 33 summarises the asset beta results for our airports comparator sample across the four separate five-year periods we have considered, based on daily, weekly and four-weekly frequencies.

839.4 Table 34 summarises leverage for each of the companies in the energy comparator sample, across the four separate five-year periods we have considered.

Table 31: 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.

Table 32: 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 33: Asset beta results for airports comparator sample

Ticker	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	-	-	-	0.76	0.72	0.60	0.90	0.82	0.78	0.87	0.92	0.97
357 HK Equity	-	-	-	0.79	0.42	0.42	0.59	0.76	1.25	0.76	0.82	0.92
600004 CH Equity	-	-	-	1.05	0.37	0.26	0.83	0.73	0.65	1.04	0.95	0.96
600009 CH Equity	-	-	-	0.74	0.71	0.65	0.83	0.79	0.80	0.91	0.85	0.81
600897 CH Equity	-	-	-	1.05	0.97	0.87	0.89	0.69	0.65	1.04	1.05	1.06
694 HK Equity	0.59	0.09	0.08	0.91	0.91	0.89	0.98	1.13	1.06	0.44	0.38	0.42
8864 JP Equity	-	-	-	0.34	0.38	0.32	0.50	0.48	0.48	0.59	0.56	0.62
9706 JP Equity	-	-	-	0.55	0.60	0.67	0.73	0.72	0.65	0.90	0.88	0.93
ADP FP Equity	-	-	-	-	-	-	0.64	0.70	0.66	0.41	0.42	0.40
AERO SG Equity	-	-	-	-	-	-	-	-	-	1.04	1.18	1.13
AIA NZ Equity	0.58	0.37	0.46	0.82	0.96	0.82	0.79	0.74	0.68	0.82	0.73	0.69
AOT TB Equity	-	-	-	0.64	0.15	0.11	0.57	0.62	0.71	0.99	1.07	1.23
ASURB MM Equity	0.38	0.04	0.04	0.41	0.41	0.70	0.58	0.54	0.68	0.69	0.75	0.69
FHZN SW Equity	0.14	0.16	0.37	0.09	0.11	0.28	0.30	0.48	0.66	0.49	0.56	0.61
FLU AV Equity	-	-	-	0.67	0.77	0.88	0.41	0.52	0.57	0.23	0.28	0.26
FRA GR Equity	-	-	-	0.31	0.53	0.61	0.63	0.73	0.74	0.37	0.42	0.40
GAPB MM Equity	-	-	-	0.23	0.03	-	0.66	0.70	0.75	0.57	0.64	0.61
GMRI IN Equity	-	-	-	-	-	-	0.91	0.89	0.97	0.38	0.41	0.50
KBHL DC Equity	0.22	0.29	0.36	0.30	0.37	0.52	0.20	0.22	0.43	0.21	0.27	0.38
MAHB MK Equity	0.97	0.10	0.12	1.12	1.16	1.11	0.70	0.71	0.79	0.67	0.86	1.07
MIA MV Equity	-	-	-	-	-	-	0.24	0.32	0.52	0.36	0.46	0.87
OMAB MM Equity	-	-	-	-	-	-	0.65	0.67	0.86	0.57	0.58	0.73
SAVE IM Equity	-	-	-	0.87	0.05	0.07	0.38	0.49	0.70	0.18	0.21	0.25
SYD AU Equity	-	-	-	0.90	0.51	0.63	0.48	0.46	0.52	0.34	0.26	0.20
TAVHL TI Equity	-	-	-	-	-	-	0.39	0.34	0.38	0.40	0.39	0.25
TYA IM Equity	-	-	-	-	-	-	0.20	0.22	0.38	0.04	0.12	0.31
Average	0.48	0.18	0.24	0.66	0.53	0.58	0.60	0.62	0.69	0.59	0.62	0.66

Table 34: Leverage results for airports comparator sample

Ticker	1996 - 2001	2001 - 2006	2006 - 2011	2011 - 2016
000089 CH Equity	-	0%	0%	4%
357 HK Equity	-	0%	0%	4%
600004 CH Equity	-	0%	5%	0%
600009 CH Equity	-	0%	6%	0%
600897 CH Equity	-	0%	0%	0%
694 HK Equity	13%	0%	18%	41%
8864 JP Equity	-	40%	33%	36%
9706 JP Equity	-	20%	18%	22%
ADP FP Equity	-	-	27%	28%
AERO SG Equity	-	-	-	0%
AIA NZ Equity	19%	20%	27%	23%
AOT TB Equity	-	20%	41%	11%
ASURB MM Equity	0%	0%	0%	0%
FHZN SW Equity	33%	75%	37%	23%
FLU AV Equity	-	0%	28%	37%
FRA GR Equity	-	13%	23%	43%
GAPB MM Equity	-	0%	0%	0%
GMRI IN Equity	-	-	23%	75%
KBHL DC Equity	34%	37%	19%	17%
MAHB MK Equity	0%	0%	0%	26%
MIA MV Equity	-	-	21%	13%
OMAB MM Equity	-	-	0%	8%
SAVE IM Equity	-	8%	14%	17%
SYD AU Equity	-	0%	49%	45%
TAVHL TI Equity	-	-	51%	41%
TYA IM Equity	-	-	2%	10%
Average	17%	12%	18%	20%

Attachment D: Nelson-Siegel-Svensson approach to modelling yield curves

Purpose of this attachment

840. 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

841. 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.[644]

842. The framework allows for a yield curve with the 'humped' shape often associated with bond-yield term structures.[645] 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.

843. 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

844. 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.

845. 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.

846. 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.

847. The NSS model is defined as (formula 1):

644 CEG "Estimating the regulatory debt risk premium for Victorian gas businesses" (March 2012).

645 When 'yield curve' is used in this paper, we are referring to a debt premium curve.

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

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.

848. 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.

849. In this paper the dataset used for estimation has been sourced from the Commission's existing debt premium and risk-free rate determination spreadsheets.

850. These determinations extract bond data from Bloomberg and annualise for use in debt premium estimation. Bonds with terms to maturity less than one year were not included in the dataset as these bonds can be affected by external factors. For example, PwC notes:[646]

> 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.

[646] PricewaterCoopers "Electranet: Estimating the benchmark debt risk premium" (May 2012), p. 13.

851. According to the European Central Bank,[647] there are four main reasons for the popularity of the Nelson-Siegel model:

851.1 the model is easy to estimate;

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

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

851.4 the model has been proven to fit data well.

852. 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

853. When creating a bond sample to for NSS curve estimates we used a three-month averaging period as it appears to be a good trade-off between relevancy and robustness.[648]

854. 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.

855. We have included majority government-owned bonds in the sample to expand the number of observations. In a 2013 report by CEG,[649] 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”.

856. 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.

857. We attempt to mitigate the non-representative effects of these additional bonds with the use of dummy variables in the NSS estimation function.

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

648 Note that future NSS curve estimates used in future as part of the debt premium methodology in the IMs will use 12 month averaging periods. The longer timeframe is more consistent with our historical averaging approach to estimate the debt premium.

649 Competition Economists Group "Estimating the debt risk premium" (June 2013), p. 14.

858. 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).

859. 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.

860. 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.

861. 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

862. Figure 19, Figure 20 and Figure 21 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 – ie, only four degrees of freedom) but the curves appear very well-fitted.

863. 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 19: October 2015 NSS Curve – BBB+

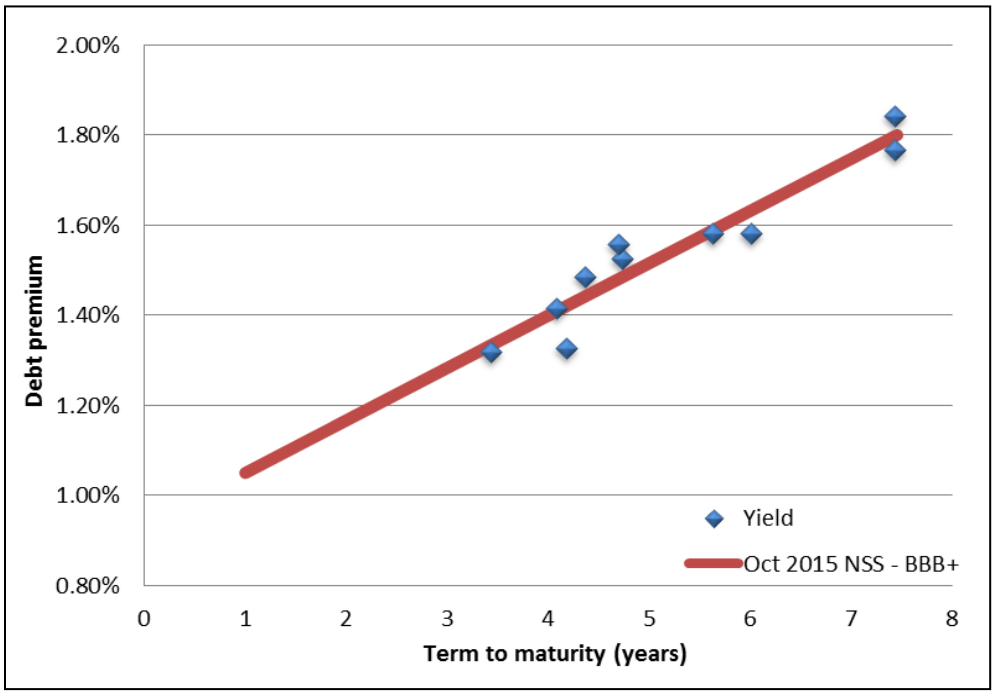


Figure 20: December 2015 NSS Curve – BBB+

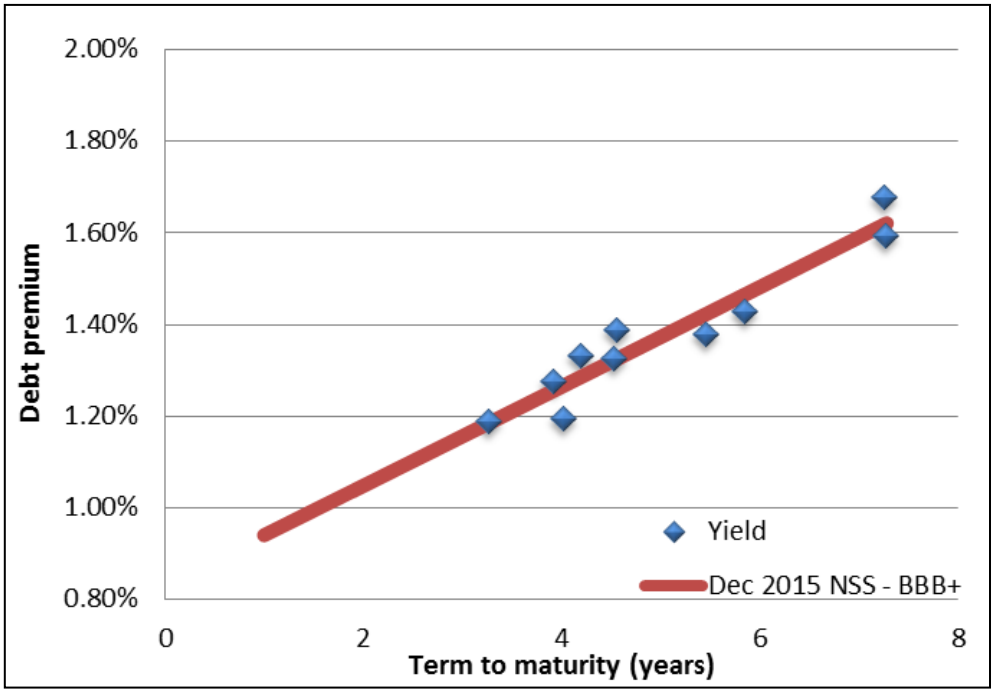
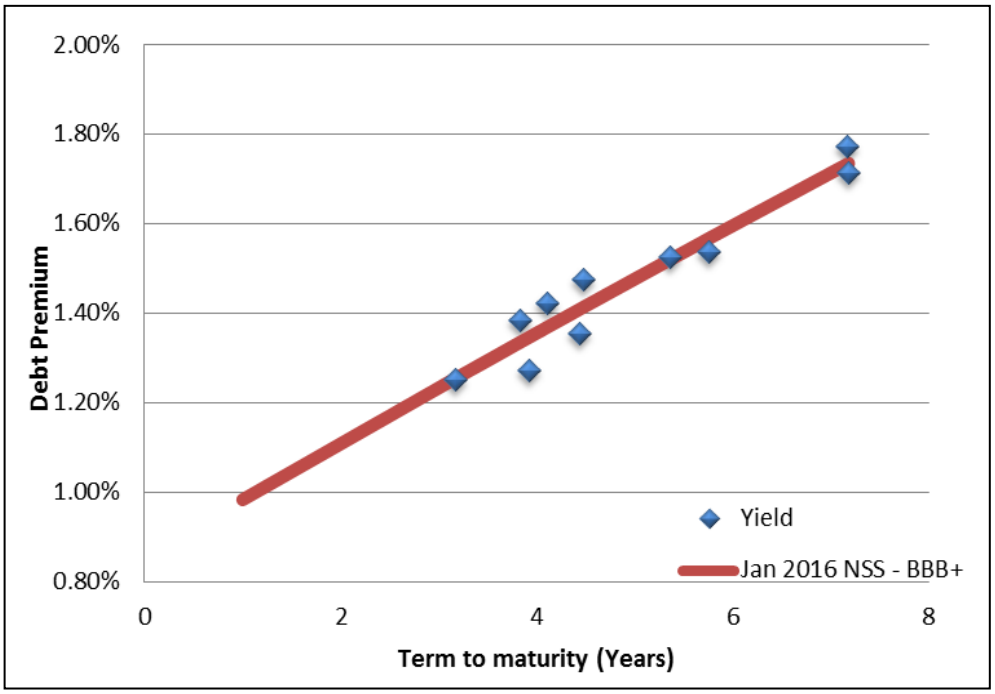


Figure 21: January 2016 BBB+ NSS Curve – BBB+



864. Table 35 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 35: 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**

865. 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

866. 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.

867. In Figure 22, 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 22: Unadjusted NSS Curve (Oct 2015 – Jan 2016)

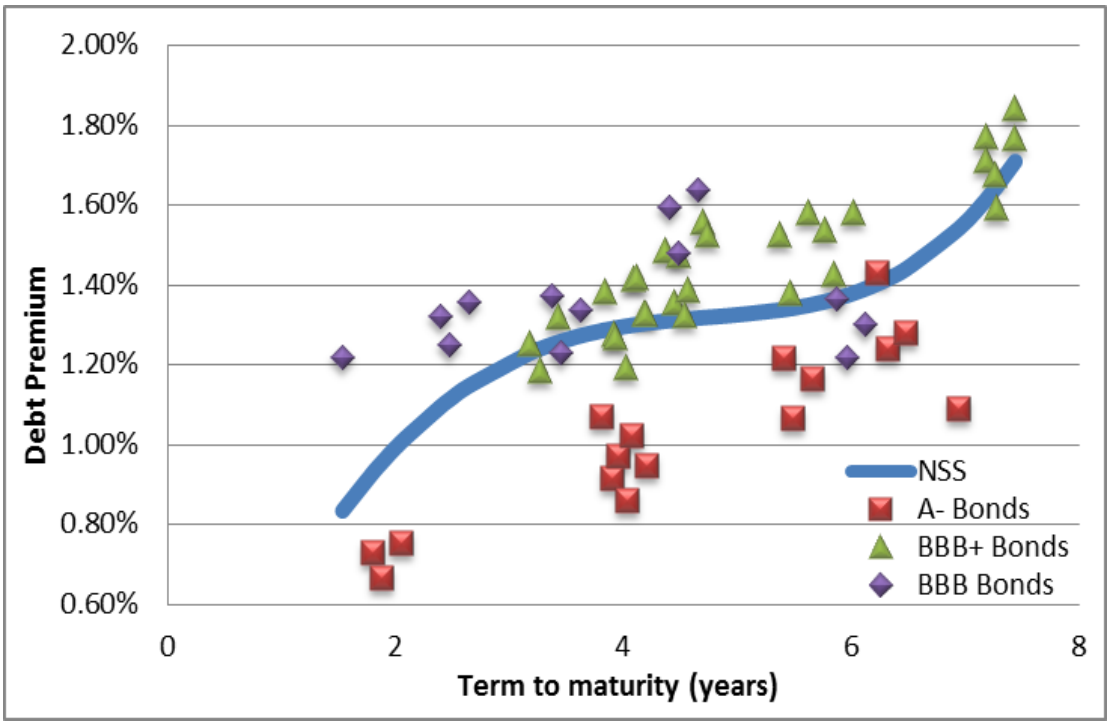
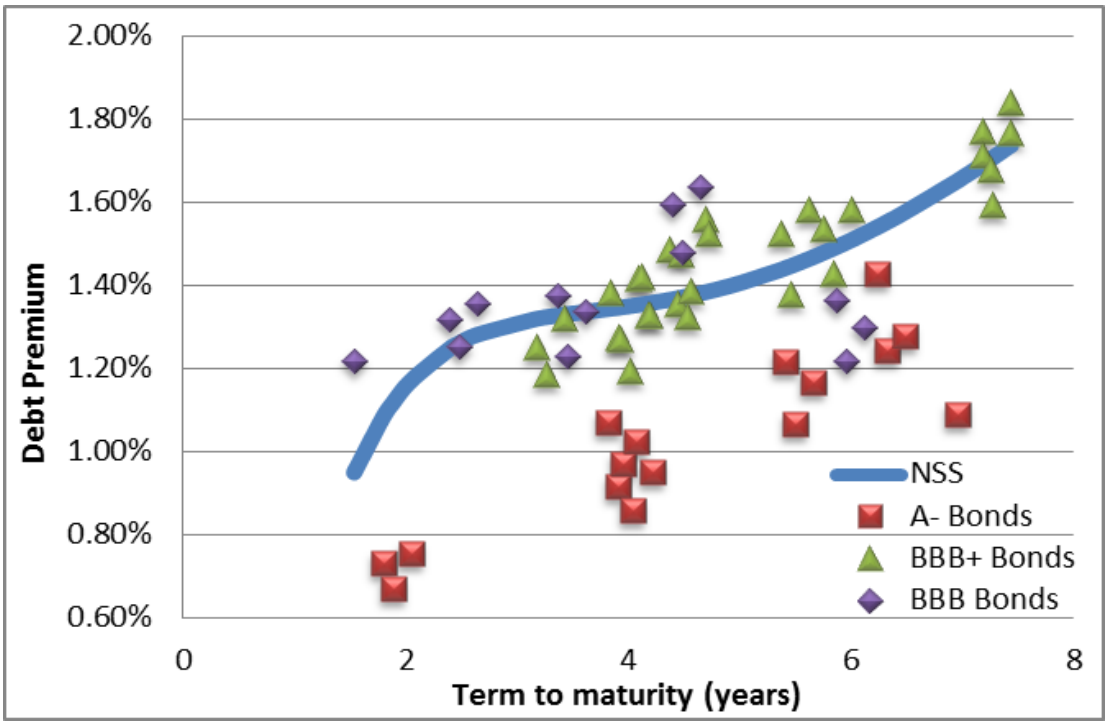


Figure 23: Adjusted NSS Curve (Oct 2015 – Jan 2016)



868. In Figure 23, 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.

869. 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 36: 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**

870. 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 24: Adjusted NSS Curve (Jan 2015 – Jan 2016)

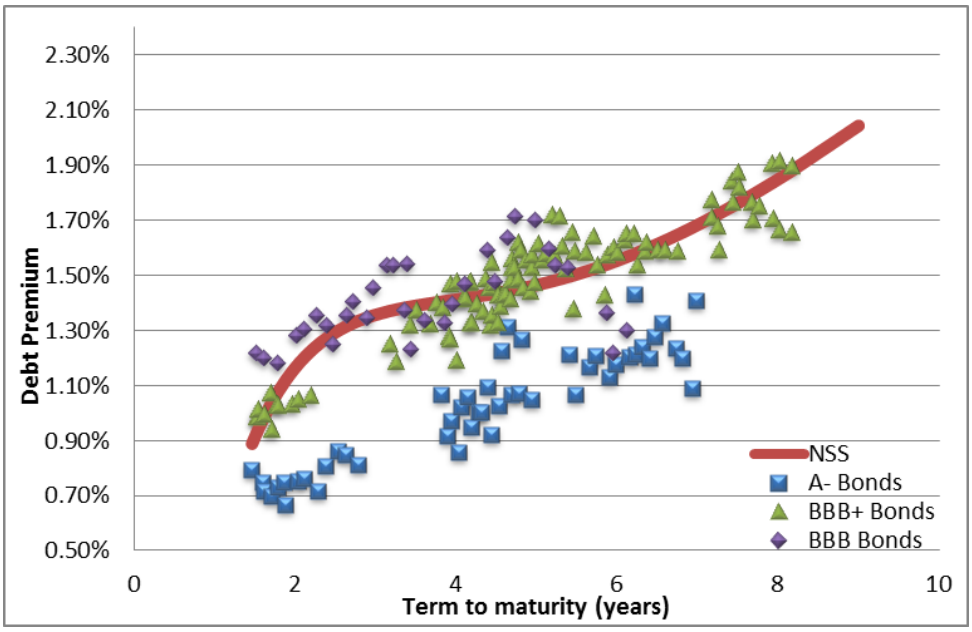
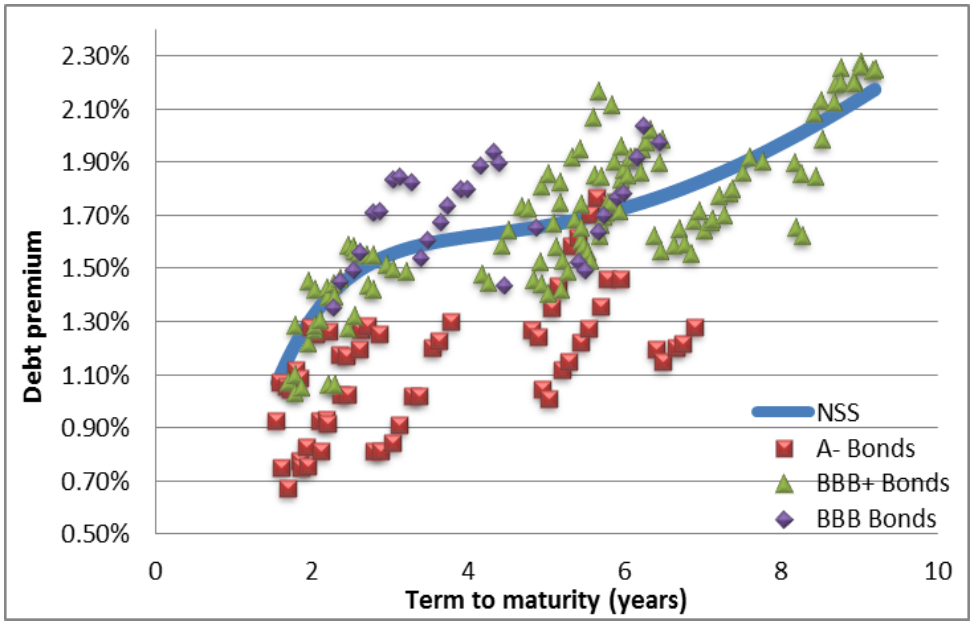


Figure 25: Adjusted NSS Curve (Jan 2014 – Jan 2015)



871. Figure 24 and Figure 25 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.

872. 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 37 for parameter values). When compared with individual monthly parameter values, there can be significant differences (as monthly curves can fluctuate between curve shapes).

873. 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.

874. 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 26: EDB/GPB NSS Curve (Jan – Mar 2016)

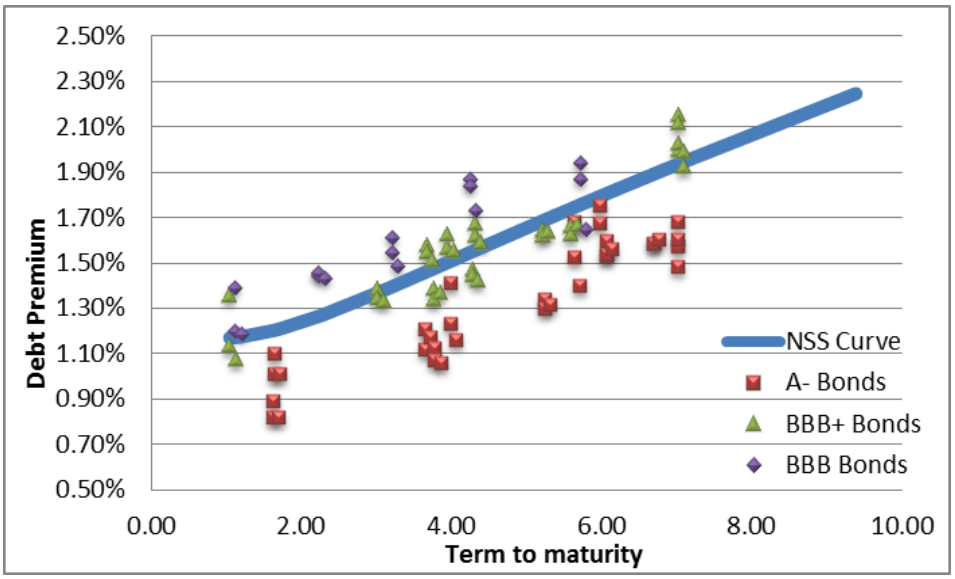
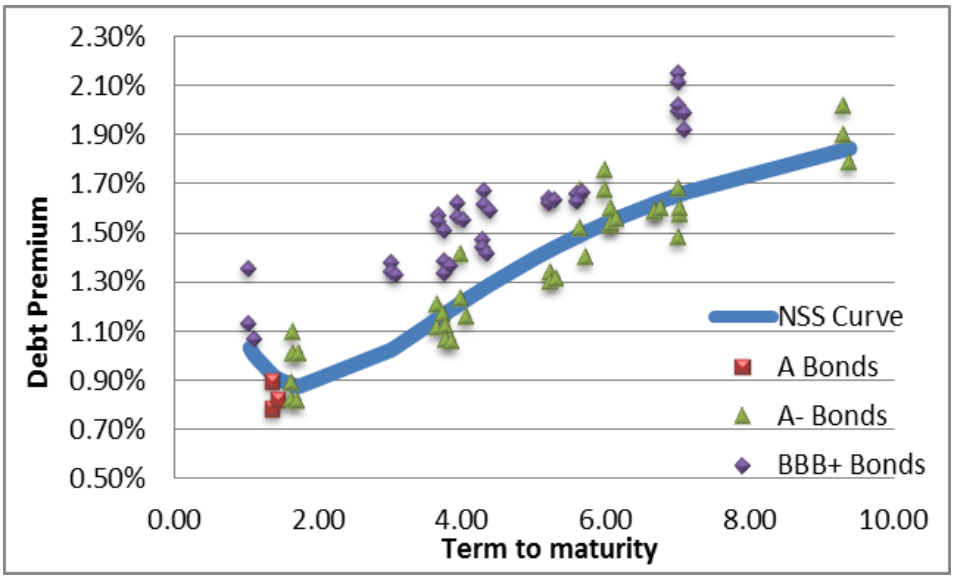


Figure 27: Airport NSS Curve (Jan – Mar 2016)



875. Figure 26 and Figure 27 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 37: 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

876. Table 37 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.

877. 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:

878. Strengths:

878.1 can observe the debt premium at any term to maturity within the range of the curve (ie, bonds not observable in the market);

878.2 can generate relatively robust estimations from the yield curve with limited observations;

878.3 strong theoretical foundations – proven to produce reliable results;

878.4 similar to methods used in other countries (specifically Australia) for use in estimating the debt premium;

878.5 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

878.6 easily replicable.

879. Weaknesses:

879.1 may be perceived as complex and not fully transparent due to the complicated functional form;

879.2 there are several assumptions that must be made in the NSS model; and

879.3 there could be a potential collinearity problem (however very unlikely).

880. 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. 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.

881. 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 .[650] 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).

882. When generating the yield curves to estimate the debt premium, we have implicitly assumed that:

882.1 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';[651]

882.2 outer-rated bonds in the sample (BBB and A-) have the same yield curve shape as the BBB+ rated bonds; and

882.3 there is no significant difference between majority government-owned corporate bonds and private corporate bonds.

883. Incorporating dummy variables for outer-rated bonds (A- and BBB) allows expansion of the bond sample while taking into account the differences from these bonds.

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650 Factor loadings represent how much a factor explains a variable.

651 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.

Attachment E: Analysis of the term credit spread differential

Purpose of this attachment

884. The purpose of this attachment is to provide further information on our changes to the TCSD.

Adjustments to the term credit spread differential

885. We have made some adjustments to the TCSD applied in the IMs. As described in paragraph 176 we decided that the policy intent for the TCSD remains valid, but that some improvements could be made to the way that it is implemented.

886. This attachment provides more information on why we considered that the approach to the TCSD could be improved and outlines changes we have made to the methodology.

    886.1 Firstly, we consider why changes to the TCSD methodology better implement the policy intent behind the TCSD.

    886.2 Secondly, we explain how we have determined a fixed relationship between original debt terms and the additional debt premium associated with debt with an original tenor over five years.

Issues with the previous approach

887. The previous IMs determined a TCSD for qualifying suppliers that was calculated using a formula that combined:

    887.1 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');[652]

    887.2 an allowance for swap costs; and

    887.3 a negative adjustment to take account of the lower per annum debt issuance costs that are associated with longer-term debt.[653]

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

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

888. 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 an assumption of debt issuance costs. The debt issuance costs were previously assumed to be 0.35% p.a. for a five-year period. This formula was specified in the IMs and meant that (proportionally) the impact was the same for all debt that had the same original term. The debt issuance costs adjustment was calculated as:[654]

(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

889. A different approach was undertaken for the spread premium. The spread premium was estimated using Bloomberg data and was calculated by using the difference between:

889.1 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

889.2 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).

890. These values were taken from Bloomberg on the date that the debt was originally issued.

891. Two issues were raised with the previous approach.

891.1 The New Zealand 'A' fair value curve is no longer published by Bloomberg.[655]

891.2 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 could 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.

892. We were aware of the potential for variability from this calculation when setting the IMs in 2010 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.[656]

893. Figure 28 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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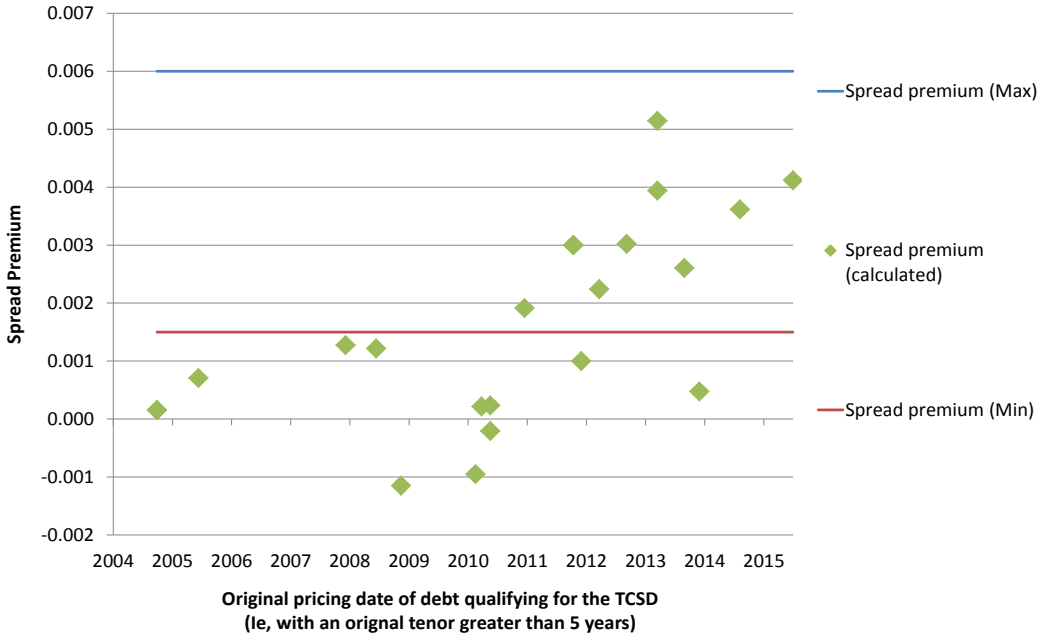
654 *Electricity Distribution Services Input Methodologies Determination 2012* [2012] NZCC 26, clause 2.4.11.

655 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].

656 For example, see: Electricity Distribution Services Input Methodologies Determination 2012 [2012] NZCC 26, clause 2.4.10.

Figure 28: Calculation of the spread premium for Transpower's 2015 TCSD

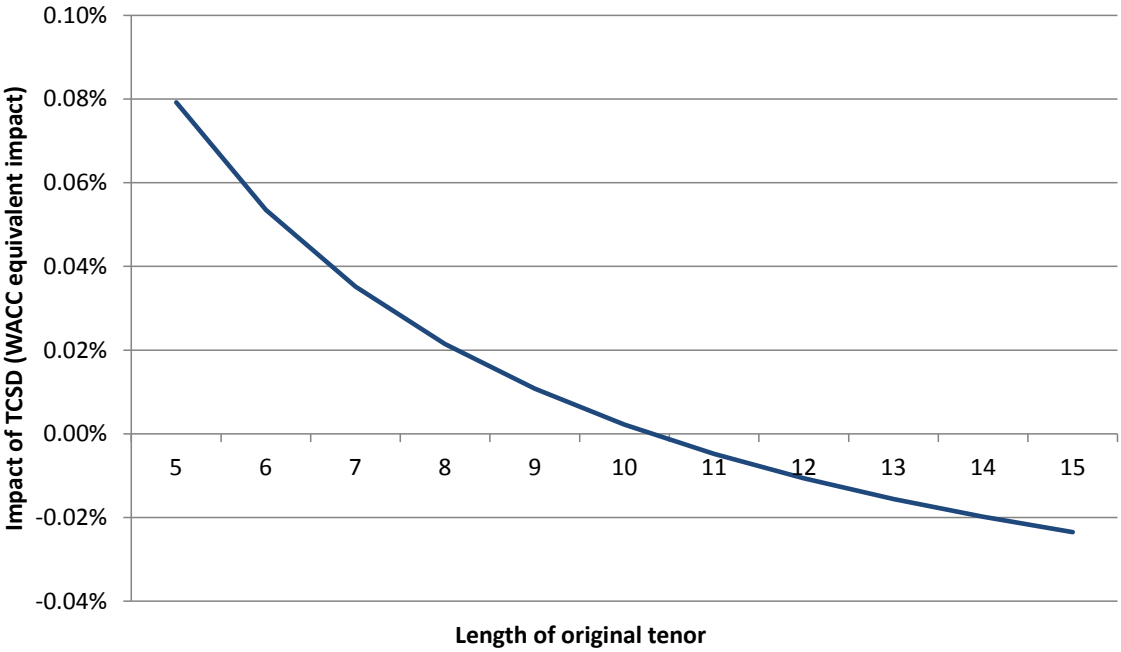


894. A problem arose when the spread premium was at the minimum value because when it was combined with the debt issuance cost adjustment it resulted in a decreasing allowance from the TCSD with increasing original term.

895. Figure 29 shows this effect and how, when the minimum value for the spread premium is used, the TCSD reduced as original tenor increased.[657]

[657] Although Figure 29 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 29: Decreasing TCSD with increasing original tenor for a spread premium at the minimum value of 0.0015



896. 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 previous approach.

Revised approach

897. We have decided that a more appropriate methodology is to determine a fixed positive relationship between original tenor of issued debt and the additional spread premium.[658] The benefits of this revised approach are to:

897.1 no longer require the use of the Bloomberg fair value 'A' Curve;

897.2 reduce the complexity and administrative burden compared to the previous approach because firms will no longer need to obtain market information on corporate bond yields or the interest rate swap rate; and

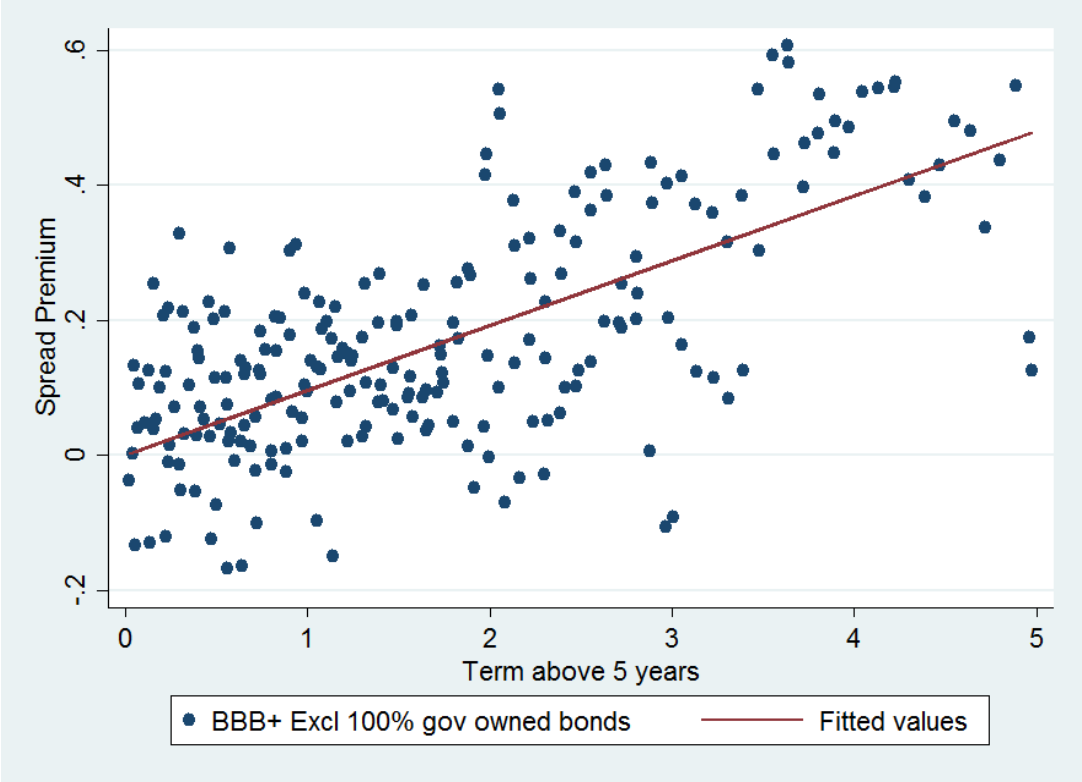
897.3 provide a positive relationship between the length of debt and the additional TCSD allowance. This is consistent with our consideration that the issuance of longer-term debt generally provides long-term benefits to consumers (due to reduced refinancing risks).

[658] 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.

898. The fixed relationship has been determined by analysing the observed spread premiums for NZ domestic vanilla bonds with remaining tenor greater than five years and an estimate (using interpolation) of the equivalent government bond rate.

899. We then fitted a linear slope to the data points associated with a specific credit rating.[659] The slope is shown in Figure 30 for BBB+ rated bonds.

Figure 30: Example of spread premium estimation



900. In the draft decision we estimated a spread premium of 5.59 bps p.a. for a BBB+ rated bonds and a spread premium of 1.72 bps p.a. for an A- rated bonds.[660]

901. In response to our draft decision, CEG suggested that we could improve the estimate of the spread premium by:

901.1 estimating a spread premium for individual months of data rather than pooling data over the whole historical period;[661]

901.2 excluding bonds that were issued by 100% government-owned companies;[662] and

659 The intercept of the linear slope was set to zero.

660 Commerce Commission "Input methodologies review draft decisions: Topic paper 4 – Cost of capital issues" (16 June 2016), para 733.

661 CEG (report prepared for ENA) submission on IM review draft decisions papers "Review of the proposed TCSD calculations" (4 August 2016), para 8.

901.3 excluding bonds that have a BVAL score below 6.[663]

902. We agree with CEG that there are some concerns with pooling across the whole sample. To account for these concerns, we have broken the full dataset into semi-annual periods to estimate spread premiums before calculating the average spread premium over the sample.

903. In analysing CEG's data, we found that some monthly spread premium estimates included large outliers and missing values due to insufficient bond observations in those months. For this reason, we focus on a semi-annual period rather than a monthly period as proposed by CEG.

904. We also agree with CEG that the yields on bonds issued by companies with 100% government ownership appear to behave differently and have lower debt premiums than other equivalent bonds. Therefore, we have excluded bonds from the sample that were issued by 100% government-owned companies.[664, 665]

905. We do not consider that we need to include the BVAL restriction in our analysis. The BVALs are a third-party assessment on the reliability of bond data, which is potentially less objective than alternative criteria. In CEG's analysis, it was also found that applying the BVAL score restriction mostly excluded bonds which, at the time, were issued by a 100% government-owned entity. Given that we have excluded these type of bonds anyway, we do not consider that including the BVAL criteria would significantly improve the dataset.

906. A key assumption required to estimate the spread premium is to obtain an estimate of the five-year debt premium so that the 'spread' can be estimated.[666] This estimate is required for each semi-annual period we have used in our analysis.

907. To provide a more robust estimate we have undertaken analysis using both CEG's estimate of the five-year debt premium which they have estimated using a NSS curve,[667] and the Commission's historical debt premium estimates in the relevant

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662 CEG (report prepared for ENA) submission on IM review draft decisions papers "Review of the proposed TCSD calculations" (4 August 2016), para 18-29.

663 BVAL scores are used as a proxy for reliability of data. Bloomberg assigns each bond yield a BVAL score from 1 to 10, with 10 being the most reliable pricing information and 1 being the least reliable. CEG (report prepared for ENA) cross submission on IM review draft decisions papers: Topic paper 4 (Cost of capital) "Review of the proposed TCSD calculations – Update report" (25 August 2016), para 1.

664 In practice this has resulted in the removal of bonds issued by CIAL and three gentailers (Meridian, Genesis, Mighty River Power) prior to their part-privatisation.

665 We have also made an equivalent change in our methodology to estimate the debt premium.

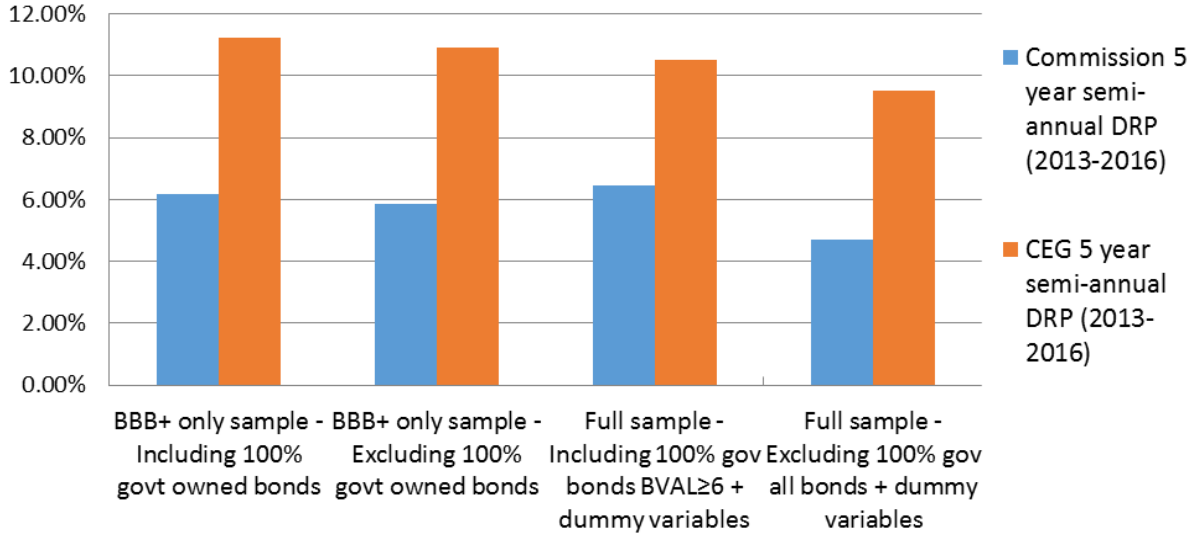
666 For example, when evaluating a seven-year corporate bond, we also need an estimate of the five-year debt premium, so the two-year spread can be estimated.

667 CEG (report prepared for ENA) submission on IM review draft decisions papers "Review of the proposed TCSD calculations" (4 August 2016), para 39.

time periods.[668] We also analysed samples using only BBB+ bonds and also samples with BBB, BBB+ and A- bonds with rating dummy variables.

908. Figure 31 shows the comparison between spread premium estimates using the Commission and CEG's five-year debt premium estimate in regard to four different samples. We have focussed on the period from 2013-2016 due to some anomalously high debt premium's estimates prior to 2013 – leading to negative spread premium estimates on longer-term bonds.

Figure 31: Comparison of spread premiums estimates using CEG and Commission estimates of the five-year debt premium



909. There is a common range between around 4.5 – 6 bps p.a. for the Commission estimates, and around 9.5 – 11 bps p.a. for the CEG slope. Giving a greater weight to the our estimates, we consider that a spread premium of 7.5 bps p.a. is a reasonable estimate. Given the variation in the results (dependent on samples/time period used), we consider an approximate judgement is more appropriate than a value from a specific dataset.

910. 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.[669] This is because:

910.1 it is straightforward to implement; and

910.2 there are difficulties in fitting NSS curves to the limited data points that we have on debt premiums greater than seven years – this is particularly relevant for A- bonds.

668 We note that these estimates have only used one month of data, but we have assumed that they are consistent over the whole six month period.

669 The use of NSS curves to help estimate the debt premium are discussed in more detail in Attachment C.

911. 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.

912. Our estimate of the issuance costs is fixed, and so therefore regardless of the debt term, the required adjustment can be calculated based on our allowance of 0.20% p.a. issuance costs for debt with a five-year original term. Table 38 provides the lower debt issuance costs associated with debt that has a longer original tenor and also how this translates to a debt issuance cost adjustment as part of the TCSD calculation.

Table 38: Debt issuance costs adjustment factor

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

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

Table 39: TCSD adjustment for different original tenor length (EDBS, GPBS and Transpower)

Tenor	**5**	**6**	**7**	**8**	**9**	**10**
Spread premium	0.00%	0.075%	0.15%	0.225%	0.30%	0.375%
Debt issuance adjustment	0.00%	-0.03%	-0.06%	-0.07%	-0.09%	-0.10%
TCSD premium	**0.00%**	**0.05%**	**0.09%**	**0.16%**	**0.21%**	**0.28%**

914. To incorporate the TCSD formula for energy businesses in the IMs we propose to:

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

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

914.3 set the maximum tenor allowed in the calculation to be 10 years; and

914.4 apply those values to any qualifying debt in the same manner as the present TCSD.

915. 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 original tenor of qualifying debt.

916. As noted in paragraph 192 we have decided not to include a TCSD allowance for airports because any spread premium is likely to be outweighed by the debt issuance cost adjustment.

Attachment F: Materiality of dual WACC approach

Purpose of this attachment

917. The purpose of this attachment is to discuss the materiality of the dual WACC approach discussed in Chapter 6.

Dual WACC option

918. We describe in Chapter 6 the potential for perverse incentives with our current approach for determining a CPP WACC.

919. Our decision is to apply the DPP WACC for CPPs. However, one alternative option that was suggested was 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.[670]

920. Submissions from suppliers did not recommend the dual WACC approach suggesting there are some implementation issues and that it adds complexity to the regime.[671]

Explanation of the Dual WACC approach

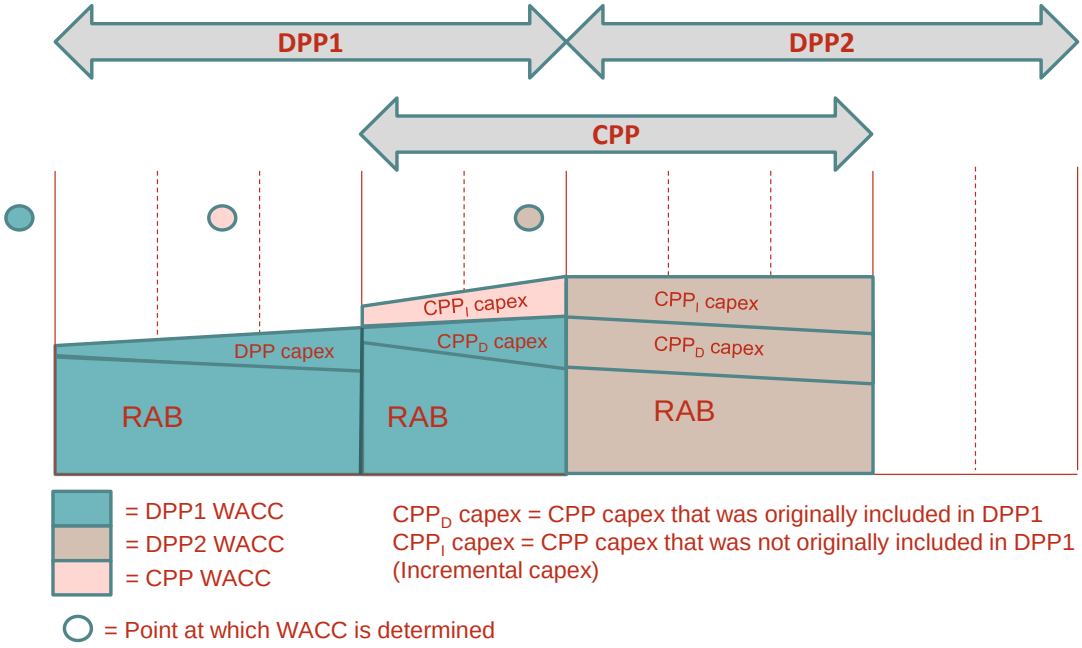
921. The dual WACC approach would have applied a different WACC to different types of capex and the existing asset base. Figure 32 provides an illustration of how this might work in practice. The capex allowance under the CPP can be split into two categories, capex that was originally allowed for under a DPP and 'incremental capex' that is the additional capex provided for under a CPP.

922. There are two variants of the dual WACC approach. The first variant (shown in Figure 32) 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.

670 Dr Martin Lally "Complications arising from the option to apply for a CPP" (18 September 2015).

671 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 32: Implementation of a dual WACC approach



923. 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.

924. 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 was considered when assessing the benefits of the dual WACC approach.

925. The materiality was 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:

925.1 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;[672] and

925.2 the CPP applies for three years before the DPP WACC is reset.[673]

926. 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

672 We expect this would be at the high end of potential step-changes under a CPP.

673 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.[674] The average over the five-year DPP regulatory period would be 6%.[675]

927. We 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%).

928. 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%

929. 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.

930. Applying a dual WACC option would have also required 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.

931. The second variant of the dual WACC approach would have been 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 have not considered this variant of the dual WACC approach in detail.

932. After considering the materiality on the price path, we have decided 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.

933. 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 will be applied to the CPP path.

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674 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.

675 10% × (3/5) = 6%.

934. This approach has the added benefit that we no longer need to estimate separate CPP WACCs.

Attachment G: Historical averaging approach to estimate the debt premium

Purpose of this attachment

935. The purpose of this attachment is to provide further information on the implementation of the historical averaging approach of the debt premium outlined in Chapter 3.

936. The historical averaging approach requires us to estimate a five-year debt premium each year and uses the average of five individual estimates (one for each year) to determine the 'average debt premium' used in the cost of debt formula in the IM determination.[676]

937. A summary of our debt premium methodology is described below.

    937.1 Use 12 months of corporate bond data when estimating future debt premiums.

    937.2 The 12 months of data corresponds to the debt premium reference year for each sector. The debt premium reference year ends on the same date as the determination window used to estimate the risk-free rate used in the WACC for price-quality paths.[677]

    937.3 For historical debt premiums (ie, for years prior to the IM review) we will average all previous debt premium estimates published by the Commission (for the relevant credit rating) that correspond to the relevant debt premium reference year.

    937.4 The average debt premium will be an average of five debt premium estimates that can be either an average of pre-IM review estimates, future estimates, or a mixture of both.

We have modified the approach proposed in the TCUP

938. The TCUP provided drafting of our original proposal to implement the historical approach. This original approach calculated an 'average debt premium' used in the cost of debt formula. This was an average of the 'debt premium' estimated each year when determining a WACC for ID.[678]

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676 For example: *Electricity Distribution Services Input Methodologies Amendments Determination 2016* [2016] NZCC 24, clause 4.4.1.

677 For airports the 'debt premium reference year' corresponds to the end of the determination window used to estimate the risk-free rate for the WACC for the information disclosure year for Auckland and Christchurch airports.

678 Commerce Commission "Input methodologies review – Technical consultation update paper" (13 October 2016), Attachment A.

939. Submissions from suppliers on the implementation of the historical average of the debt premium suggested that:

939.1 we should use 12 months of data to estimate the debt premium each year rather than the three months proposed;[679] and

939.2 the same determination windows should be used for the debt premium as the risk-free rate.[680]

940. After considering these submissions, we have made some changes to the methodology that we consider better implements the policy intent to provide a representative five-year debt premium.

941. Our revised approach to estimating the annual five-year debt premium only comes into effect in the future (ie, following the IM review). We will not be re-estimating historical debt premiums (ie, for years prior to the IM review). Instead, to estimate a historical debt premium we will average all of the relevant debt premiums already published by the Commission in that particular year.

Future estimates of the debt premium

942. Future estimates of the debt premium will use 12 months of corporate bond data to estimate an annual premium. This was suggested by the ENA as an improvement to our suggested approach.[681]

> The ENA supports a move to a historical average approach for the debt premium. However, the ENA questions why the historical average has been specified in this way, and not as an average of the full five year period. This could be achieved for example by extending the annual determination window to 12 months, or by estimating a debt premium every quarter and then averaging the quarterly values over 5 years.

943. We agree that using 12 months of data provides a more comprehensive estimate with only a limited amount of additional administrative effort. It reduces the risk that anomalous periods are not captured in the dataset.

944. We have also changed the alignment of the 12 months of data used so that it is consistent with the end of the determination window used to estimate the risk-free rate.

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679 ENA "Input methodologies review: Technical consultation update paper – Submission to the Commerce Commission" (3 November 2016), para 34; Vector "Vector submission on the draft amended input methodologies determinations" (3 November 2016), p. 7; Orion submission on IM review technical consultation and on the ENA letter regarding live-line work "Submission on input methodologies review technical consultation" (3 November 2016), para 12.

680 Transpower "Input methodologies review: Technical consultation on updates to draft determinations" (3 November 2016), p. 5-6; ENA "Input methodologies review: Technical consultation update paper – Submission to the Commerce Commission" (3 November 2016), para 37.

681 Transpower "Input methodologies review: Technical consultation on updates to draft determinations" (3 November 2016), p. 5-6; ENA "Input methodologies review: Technical consultation update paper – Submission to the Commerce Commission" (3 November 2016), para 34.

945. The specific alignment of the 12 month window is not expected to have a large impact on estimates, given we will use five years of data. However, we consider that it is more appropriate than aligning the reference period with disclosure years because we will be able to use the most recent available data when setting the WACC for price-quality paths. This is important because it is only the WACC for price-quality paths that directly affects allowable revenue for regulated suppliers.[682]

946. Airports are not subject to price-quality paths and so we have set the debt premium reference year for airports to align with the disclosure year of Auckland and Christchurch airports.

947. We do not consider it is necessary or desirable to have a separate historical average estimate for different suppliers in the same sector. There is likely to be minimal impact from a slightly different alignment window and so we have used one debt premium reference year for the whole airport sector and have chosen the disclosure year that covers airports that in combination have the largest RAB.[683]

948. The debt premium reference years (**DPRY**s) that will be used for each sector are therefore:

    948.1 EDBs – September to August;[684]

    948.2 Transpower – September to August;

    948.3 GPBs – March to February; and

    948.4 Airports – July to June.

Estimates of the debt premium for years prior to the IM review

949. The TCUP suggested that when estimating the debt premium for previous years we would use the debt premiums previously estimated by us for each ID year for each supplier. However we have now modified this approach to take into account all debt premium estimates in a particular year for the relevant credit rating.[685]

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682 We will use the same debt premium estimate for ID, as for price-quality paths. This will result in a slight misalignment between the risk-free rate used for ID and the debt premium, however we consider the impact will be minimal because we are using a five year historical average.

683 This approach means that WACC estimates determined for different quarters but subject to the same debt premium reference year will have identical values for the debt premium.

684 For example, the 'debt premium reference year 2017' for EDBs is the period September 2016 to August 2017.

685 Ie, we will now include the debt premiums estimated for ID, DPPs, IPPs, and CPPs.

All the relevant Commission estimates within a 'debt premium reference year' will be used to estimate the debt premium for the years prior to the IM review.

950. Table 40 shows a summary of all of these previous debt premium estimates by the Commission and the average over each debt premium reference year.[686, 687]

951. We will average all relevant estimates within a debt premium reference year to obtain an annual debt premium for all sectors.[688]

Combining previous and future estimates

952. To achieve a final historical average, we will combine five years of data. For example to obtain a historical average for the EDB IPP reset in 2020 we will average the debt premiums estimated for the reference years 2016-2020. The values for 2016 and 2017 are already known (1.59% for both years), and the values for 2018, 2019, 2020 will be estimated in each year prior to the reset.

953. For example the 'average debt premium' in each sector calculated as per the date of the final IM decision are:

953.1 EDBs and Transpower: (2.24% + 2.04% + 1.76% +1.59% + 1.59%)/5 = **1.84%**

953.2 GPBs: (1.90% + 2.34% + 1.84% + 1.66% + 1.54%)/5 = **1.86%**

953.3 Airports: (2.06% + 1.50% + 1.25% + 1.05% + 1.38%)/5 = **1.45%**

686 Note that that shows the date of publication of the WACC determination and the market data used to estimate the WACC is from the previous month (for example the September 2016 BBB+ WACC estimate of 1.71% uses market data from August 2016). Therefore when determining the historical estimates for each debt premium reference year the averaging period is lagged by a month compared to the period described in para 948.

687 All of these previous WACC determinations (including our estimate of the debt premium used) are available on the Commerce Commission website at: http://www.comcom.govt.nz/regulated-industries/input-methodologies-2/cost-of-capital-2/

688 These historical values have been specified in the IM determination.

Table 40: Previous debt premium estimates publish by the Commission

Year	Month	Date	5 year debt premium BBB+	5 year debt premium A-	Debt premium (EDBs and Transpower)	Debt premium (GPBs)	Debt premium (Airports)
2011	4	Apr-11	1.70%	1.39%			
2011	6	Jun-11					
2011	7	Jul-11	1.75%	1.64%		DPRY 2013 = 1.90%	
2011	9	Sep-11	1.90%				DPRY 2013 = 2.06%
2011	10	Oct-11	1.90%		DPRY 2013 = 2.24%		
2011	12	Dec-11	2.00%				
2012	1	Jan-12	2.15%				
2012	3	Mar-12					
2012	4	Apr-12	2.35%	1.94%		DPRY 2014 = 2.34%	
2012	6	Jun-12					
2012	7	Jul-12	2.55%	2.18%			DPRY 2014 = 1.50%
2012	9	Sep-12	2.50%				
2012	10	Oct-12	2.45%		DPRY 2014 = 2.04%		
2012	12	Dec-12	2.15%				
2013	1	Jan-13	2.05%				
2013	3	Mar-13					
2013	4	Apr-13	2.05%	1.54%		DPRY 2015 = 1.84%	
2013	6	Jun-13	1.85%				
2013	7	Jul-13	1.85%	1.45%			DPRY 2015 = 1.25%
2013	9	Sep-13	1.85%				
2013	10	Oct-13	1.80%		DPRY 2015 = 1.76%		
2013	12	Dec-13	1.70%				
2014	1	Jan-14	1.80%				
2014	3	Mar-14	1.85%				
2014	4	Apr-14	1.80%	1.31%		DPRY 2016 = 1.66%	
2014	6	Jun-14	1.75%				
2014	7	Jul-14	1.75%	1.18%			DPRY 2017 = 1.05%
2014	9	Sep-14	1.65%				
2014	10	Oct-14	1.55%		DPRY 2016 = 1.59%		
2014	12	Dec-14	1.55%				
2015	1	Jan-15	1.60%				
2015	3	Mar-15	1.65%				
2015	4	Apr-15	1.65%	1.09%		DPRY 2017 = 1.54%	
2015	6	Jun-15	1.60%				
2015	7	Jul-15	1.53%	1.00%			DPRY 2017 = 1.38%
2015	9	Sep-15	1.62%				
2015	10	Oct-15	1.56%		DPRY 2017 = 1.59%		
2015	12	Dec-15	1.35%				
2016	1	Jan-16	1.46%				
2016	3	Mar-16	1.58%				
2016	4	Apr-16	1.64%	1.36%			
2016	6	Jun-16	1.72%				
2016	7	Jul-16	1.70%	1.40%			
2016	9	Sep-16	1.71%				