Regulatory Precedents for Setting the WACC within a Range

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CONTENTS

EXECUTIVE SUMMARY

The Commerce Commission is undertaking a review into certain matters in relation to how it sets the weighted average cost of capital (WACC) for regulatory price-setting purposes. To assist in the review the Commission contracted Economic Insights to provide a report summarising overseas regulatory decisions on the use of WACC estimates above, below, or at the mid-point estimate. This report updates the report of 16 June 2014 to take account of relevant comments in cross-submissions.

Most regulators present a range for either the WACC or key parameters in its calculation. In terms of ranges most of the focus is on the return on equity and its underlying parameters. Ranges that are presented are generally not formal statistical confidence intervals particularly for the WACC as a whole.

The New Zealand Commerce Commission is exceptional in that it makes use of a normal distribution and an assumed standard error for the WACC to calculate a range defined by the 25th and 75th percentiles. The range is published for information disclosure regulation and a WACC based on the 75th percentile is allowed for price-quality path regulation.

When ranges and percentiles are reported for regulatory decisions in other jurisdictions the percentiles are not generally comparable to the percentiles calculated from a normal distribution. Previous studies calculating percentiles for overseas jurisdictions, particularly Frontier (2014b) and Castalia (2014), implicitly assumed the ranges reported by regulators have a uniform distribution where every observation has the same weight. For comparative purposes, where percentiles are reported from other jurisdictions in the body of this report, the same method is used. However, the focus of this study, in terms of a like-for-like comparison between jurisdictions, is on the basis point adjustment that is made to the mid-point of reported ranges for a nominal vanilla WACC.[1] This form of the WACC is the most widely referred to in regulatory decisions or is relatively easy to calculate. The nominal form can be used for reasonable comparisons where inflation is relatively low and similar periods are used.

There are a number of other issues that complicate comparisons of regulatory decisions across jurisdictions. There is likely to be a stronger rationale for an adjustment to the mid-point of a reasonable WACC range where the regulatory arrangements entail aspects that conflict with the underlying assumptions that apply to specific methods for determining key parameters. Relevant features of the regulatory arrangements that have important implications for allowed rates of return include the scope to undertake asset revaluations based on ex post optimisation, the form of price regulation and its impact on risk and the operation of various incentive mechanisms. Notable differences in regulatory regimes that would impact on the WACC are identified but a detailed assessment has not been made of all aspects of regulation in this brief review.

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[1] The nominal vanilla WACC is a weighted average of a nominal pre-tax cost of debt and a post-tax cost of equity (reflecting the impact of the corporate tax), with the weights reflecting the allowed capital structure.

Table 1 contains a summary of WACC decisions in Australia, Europe, the United Kingdom and the United States. Table 2 contains a summary of WACC decisions in New Zealand.

Many decisions make no or a relatively small adjustment to the mid-point of a reported range. This often reflects adopting a conservative view of the market risk premium and equity beta that are used in the Capital Asset Pricing Model (CAPM) for determining the return on equity, where 'conservative' means erring on the high side.

In **Australia** the most material adjustment has been made by the Australian Energy Regulator in a recent decision, where it has adopted a market risk premium above the mid-point, an equity beta at the top of the range and a cost of debt at the top of a range. The latter is likely to be a transitional position until data issues are resolved. The adjustments to the mid-points for these assumptions imply uplifts of 61 and 37 basis points respectively. In recent decisions, other Australian regulators have either made no adjustment to point estimates or made basis points adjustments up to about 20 basis points above the mid-point. Although IPART makes no explicit WACC uplift except in situations where there is a high degree of economic uncertainty, it has adopted a method of average WACCs calculated using long-term and short-term parameters, and in recent market conditions this may have given rise to a higher WACC than would be the case if only short-term parameters were used. But for future reviews this type of comparison will be sensitive to prevailing market conditions.

In **Europe**, for the decisions reviewed there was no uplift reported in four of seven cases with no disclosure in the other three cases. In France a 300 basis point uplift is allowed for certain new investment in gas transmission. In Denmark the return on capital for electricity distribution is capped at the 30 year mortgage rate plus 1 per cent. In the Netherlands although no uplift was reported, conservative estimates of parameters are adopted but no detail was provided.

In the **United Kingdom** the Competition Commission and sector regulators have preferred WACCs that represent material uplifts to the mid-point: 41-49 basis points for the Competition Commission, 87.8 basis points for Ofwat and 23.5 basis points for Ofcom. These uplifts have reflected recognition of uncertainty in estimates, particularly given the economic environment following the global financial crisis and the need to ensure financing of new investment.

However, in its most recent decision for setting a price cap for Northern Ireland electricity transmission and distribution, the Competition Commission (2014) set a range and point estimate of the WACC that was materially less than in decisions for 2010-14 but with a risk free rate materially above that indicated by current market conditions.

Ofgem (2014) also recently specified a preferred estimate for electricity distribution that was 22 basis points below the mid-point of the range specified in its Strategy Decision (Ofgem 2013) for the price period 2015-23.[2] This contrasts with its decisions for electricity transmission and gas transmission for the period 2013-21 where it set preferred estimates that were 16.5 and 7.7 basis points respectively above the reported range (Ofgem 2012). Ofgem

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[2] The preferred estimate for the cost of equity was consistent with an estimate based on the mid-point of the preferred range of the Competition Commission (2014).

also uses a trailing average cost of debt approach which should reduce risk relative to assuming a forward looking measure.

In the **United States** the Federal Communications Commission has allowed a WACC for rate of return regulated local carriers at the 75th percentile (of a uniform distribution) since 1990. A recent staff report has recommended a materially lower point estimate, reflecting changes in market conditions, but still at the 75th percentile. The methodology in the staff report has been used to approve WACCs for the telecommunications universal service fund.

In contrast the Federal Energy Regulatory Commission has until recently adopted the median estimate for an individual entity and the mid-point of a range for a group application for electricity transmission and the median for gas pipelines. However, in June 2014, FERC decided to adopt the method of setting the return on equity at the point halfway between the centre of the 'zone of reasonableness' and the range's highest point (i.e. the 75th percentile). FERC explained its primary concern that led to this decision as related to anomalous capital market conditions

At the State level 17 decisions were reviewed from 12 States. The decisions related to electricity or gas distribution or to vertically integrated electricity utilities. The focus in terms of ranges and adjustments was on the return on equity with most regulators allowing the embedded cost of debt.

Four decisions in California, two decisions in New York and one decision in Pennsylvania entailed uplifts in the WACC of from 12.5 to 24 basis points. In Indiana an uplift of 8.5 basis points was reported. In California uplifts are allowed based on the need to ensure financial soundness while balancing the interests of shareholders and rate holders. In New York one of the outcomes was reached by negotiation. In Pennsylvania the uplift was allowed as a management effectiveness incentive and to help fund significant improvements.

Five states used the mid-point of a return on equity range. In some cases this meant a slight adjustment to the nominal vanilla WACC. In Illinois the rate of return is specified on a statutory basis at an average of the 30 year US treasury bond yield plus 5.8 percentage points.

Massachusetts specified a preferred estimate that was 7 basis points below the mid-point of a reasonable range based on the lower risk associated with the decoupling of revenues from costs. Two states did not disclose their methods but relied on a negotiated return.

Turning to the estimates for **New Zealand** (Table 2) the most notable feature is that the 75th percentile of the assumed normal distribution corresponds to uplifts in the range of 71 to 99 basis points. This is generally higher than the estimates from other jurisdictions reported in this paper.

The international review of regulatory cost of capital decisions suggests there has been a broad tendency in more recent decisions in several jurisdictions to reduce basis point adjustments or adopt a midpoint estimate. A few of the examples are as follows.

In Australia, the Independent Pricing and Regulatory Tribunal (IPART) in NSW has moved away from its previous practice of usually providing a significant uplift to the allowed rate of return, to preferring a mid-point WACC except in situations of significant economic uncertainty.

In the United Kingdom, Ofgem, in its most recent decision on the methodology for assessing the rate of return for electricity distribution companies, adopted a cost of capital below its midpoint estimate. In part this reflected greater weight now given to current market conditions and reduced preparedness to provide substantial uplifts to the cost of capital.

In the United States, the Federal Communications Commission (FCC) recently reduced allowed rates of return for regulated telecommunications carriers, principally to reflect current market conditions, but it also adopted a cost of capital closer to the middle of its estimated range of reasonableness.

An apparent exception is the Federal Energy Regulatory Commission (FERC). Although it has signalled a tighter approach to the approval of transmission rate of return incentives and lowered the allowed return on equity materially for the electricity transmission network in six New England states, it has also recently made a ruling for a return on equity midway between the central estimate and the top of the "zone of reasonableness". At present it is not certain whether this is intended to be ongoing policy or a temporary response to current market conditions. We estimate that FERC's decision results in an uplift of approximately 60 basis points to the vanilla WACC compared to the central estimate.

A number of cross-submissions and accompanying consultant reports commented on the report of 16 June 2014. The arguments presented in these papers are considered, and the broad conclusions of the June 2014 report are still regarded as reasonable. However, it is noted that it is important to use supplementary information on investment outcomes in determining an appropriate allowed rate of return.

Table 1: Summary of Regulatory Decisions on WACC[3] in Australia, Europe, the United Kingdom and the United States

Country Regulator, Regulatory Period	Sector	mid-point	Basis points uplift to mid-point	Notes
Australia				
AER, 2013 (methodology)	Electricity & gas distribution & transmission	See below		Up-lift to mid-point for market risk premium and equity beta, scope for higher estimates of other parameters or recognition of special factors.
AER, 2014-15	Electricity distribution	7.43	61	Assuming range for market risk premium and equity beta in methodology paper and top of transitional range for cost of debt.
		7.43	37	Assuming range for market risk premium and equity beta and mid point of transitional range for cost of debt.
ERA (WA), 2014	Gas trans. & distribution	6.43	13	Uplift reflects combination of market risk premium below mid-point and equity beta at top of range.
ERA (WA), 2013-14,	Urban, general freight and bulk freight rail networks	5.56, 7.89, 10.06	None	No reported range but preferred market risk premium in issues paper is below mid-point of specified range.
ESC (Vic), 2013	Urban water businesses	6.89	20.5	Uplift based on conservative estimates of key parameters.
ESC (Vic), 2008	Gas distribution	8.97	18	Uplift based on conservative estimates of key parameters.
IPART (NSW) 2014-19	Rail network	9.05	None	No adjustment based on estimate of uncertainty index

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[3] All estimates for the nominal vanilla WACC.

Country Regulator, Regulatory Period	Sector	mid-point	Basis points uplift to mid-point	Notes
QCA, (Qld) 2010-13	Urban water businesses	9.35	None	Methodology is being reviewed but point estimates still being used in recent decisions.
Europe				
Denmark, 2008	Electricity Dist.	7.5	None	Return is capped at 30 year mortgage bond plus 1%.
Finland, 2012-15	Elect. dist & trans.	Point est.	Undisclosed	0.5% uplift for liquidity and 5% market risk premium
France, 2013-16	Gas trans.	6.5	Undisclosed	3% uplift allowed for certain new investment.
France, 2009-12	Elect. trans. & dist.	7.25	Undisclosed	Allowed return has been unchanged since 2000.
Netherlands, 2007-10	Electricity trans.	6.7	None	Parameters are conservative.
Portugal, 2013	Telecommunications	11.69	None	WACC is updated annually
Sweden, 2012-15	Electricity trans.	Mid-point	None	Average of mid-point of two ranges is specified
United Kingdom				
Competition Commission (CC), 2012-17	Electricity trans. & distribution	7.07	41	Lower than in decisions from 2007-10. Range for risk free rate was above current market information.
CC, 2008-13	Heathrow airport	8.01	46	Focus on ensuring necessary new investment.
CC, 2008-13	Gatwick airport	8.21	49	As above
Ofcom, 2016-17	Telecommunications	6.93	23.5	Uplift due to choice of market risk premium at top of range (5%).
Ofgem, 2015-23	Electricity distribution	7.39	-22	Preferred estimate is described as central reference point but represents lowest point of cost of equity range.

Country Regulator, Regulatory Period	Sector	mid-point	Basis points uplift to mid-point	Notes
Ofgem, 2013-21	Electricity transmission	7.78	16.5	Preferred estimate is described as central reference point but represents an estimate in the upper half of cost of equity range.
Ofgem, 2013-21	Gas transmission	7.69	7.7	Preferred estimate is described as central reference point but represents an estimate in the upper half of the range for the cost of equity.
Ofwat, 2010-15	Water & sewerage	7.64	87.8	Uplift based on assessment of range of evidence
United States				
FCC, 1990 to date	Local exchange carriers	mid-point not available	75th percentile	Allowed WACC of 11.25% has been in place since 1990. 2013 staff report recommends a materially lower range and preferred estimate but still at 75th percentile (uniform distribution).
FCC, 2014 to reset	Telecommunications universal service fund	7.84	66	Applied FCC (2013) staff report methodology. The methodology justifies choice of 75th percentile based on credit worthiness, historically low interest rates and infrequency of re-prescription.
FERC, 2011-reset	Electricity transmission	Median for individual, mid-point for group	Uplifts for certain investment incentives.	Uplifts have been allowed for investment incentives and specific risks but policy paper signals a tighter approval regime.
FERC, (2014)	Electricity transmission	7.19	60	Mid point of upper half or range of reasonableness for return on equity based on need to ensure appropriate investment given anomalous capital market conditions.
FERC, continuing practice	Gas pipelines	Median	None	

Country Regulator, Regulatory Period	Sector	mid-point	Basis points uplift to mid-point	Notes
California, 2013-15	Elec. & gas dist (4 companies)	7.63, 7.78, 7.90, 7.96	16.0, 12.5, 12.5, 14	Rationale based on assuring financial soundness while balancing interests of shareholders and rate payers.
District of Columbia, 2012-	Electricity dist.	8.03	None	Return on equity and range adjusted down by 50 basis points for decoupling.
Georgia, 2010 -	Electricity utility	Mid-point	None	Negotiated outcome (approved stipulation)
Illinois, 2013-	Electricity services	6.9 US T-bond + 5.8	None	Statutory requirement that return on equity is set at 30 year US treasury bond yield plus 580 basis points.
Indiana, 2013 -	Electricity utility	6.89	8.5	Represents the mid-point of ranges proposed by parties
Florida, 2013-16	Electricity utility	8.39	0.5	Mid-point of return on equity preferred.
Massachusetts, 2010-reset	Electricity dist.	7.93	-7.0	Return on equity mid-point adjusted down for decoupling.
North Carolina, 2012-reset	Electricity utility	7.91	-2.5	Mid-point of return on equity preferred.
Maryland, 2013-reset	Electricity dist.	7.63	0.5	Mid-point of return on equity preferred.
Ohio, 2013-reset	Electricity dist.	7.72	Not disclosed	Return on equity agreed through negotiation
Pennsylvania, 2013-reset	Electricity dist.	7.85	14.0	Uplift for management effectiveness incentive and need to fund significant improvements.
New York, 2014 -reset	Electricity	6.91	19.0	Agreed through negotiation
	Gas	6.91	24.0	Agreed through negotiation
New York 2009- reset	Electricity and gas	Not disclosed		Not disclosed

Source: Annex A

Table 2: Commerce Commission Decisions on 75th percentile for WACC[4]

Form of regulation – Sector – Regulatory Period	mid-point	75th percentile	Basis points uplift to mid-point
Default price-quality path regulation			
Electricity distribution businesses – 2010-15	8.05	8.77	72
Gas pipeline businesses 2013-17	6.63	7.44	81
Customised price-quality price regulation			
Orion electricity distribution – 2014-19	6.21	6.92	71
Individual price-quality path regulation			
Transpower electricity transmission – 2011-15	7.33	8.05	72
Information disclosure regulation			
Electricity distribution - 2015	6.89	7.60	71
Wellington Airport – 2015	7.70	8.68	98
Maui Development (gas transmission) - 2015	7.66	8.47	81
Powerco (gas distribution) -2014	7.58	8.39	81
Transpower (electricity transmission) 2014	6.13	6.85	72
Vector and GasNet (gas pipelines) 2014	6.84	7.65	81
Auckland Airport and Christchurch Airport - 2014	7.01	8.00	99

Source: New Zealand Commerce Commission

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[4] For price quality path regulation a WACC up to the 75th percentile is allowed. For information disclosure regulation a range between the 25th and 75th percentiles is published.

1 INTRODUCTION

The Commerce Commission (the Commission) is undertaking a review into certain matters in relation to how it sets the weighted average cost of capital (WACC) for regulatory price-setting purposes.

To assist in the review the Commission contracted Economic Insights to provide a report summarising overseas regulatory decisions on the use of WACC estimates above, below, or at the mid-point estimate, primarily from the UK, Europe, Australia and the US.

An Economic Insights report dated 16 June 2014 was prepared and published on the Commission's website. The report reviewed methodologies and decisions of: the Australian Energy Regulator; Australian Competition Tribunal, four Australian State regulators; several national regulators in Europe; the Competition Commission, Ofcom, Ofgem and Ofwat in the UK; and FCC, FERC and several state regulators in the US.

The report focused on the most recent decisions, most of which cover prospective periods so that parameters should reflect regulatory assessments of the impact of the global financial crisis of 2007-2008 and subsequent economic conditions.

A number of submissions and consultant reports commented on the report. The Commission requested Economic Insights to review the comments and make changes as appropriate.

This report updates the report of 16 June 2014 to take account of relevant comments. The structure of the rest of this report is as follows:

- Section 2 discusses some methodological issues in making comparisons of cost of capital regulatory decisions across jurisdictions.

- Section 3 presents the results of the comparisons of cost of capital regulatory decisions.

- Section 4 responds to specific comments on the report of 16 June 2014 that are not addressed in the body of the report.

2   METHODOLOGICAL ISSUES

In making comparisons across jurisdictions it is important to recognise that the rationale for making an adjustment to the WACC, which in the first place is based on the mid-point or median from a reasonable range, will depend on various aspects of the regulatory arrangements as well as how the reasonable range was determined in the first place.

2.1 REGULATORY TREATMENT OF ASSET BASE AND ASYMMETRIC RISK

A key issue in choosing appropriate regulatory parameters for the cost of capital is the extent to which the regulatory arrangements provide assurance that investors can expect to recover the capital they invested as well as earn an appropriate risk-adjusted opportunity cost of capital.

This consideration underlies the use of the NPV=0 or financial capital maintenance principle which has been explicitly adopted by the Commerce Commission and other regulators in various forms. An aspect of that principle that may not always be clear or well understood is the regulatory treatment of the asset base and how it is valued and depreciated for regulatory purposes. If for example there is likelihood of substantial asset revaluations to reflect ex post optimisation, compared to a situation where there was near certainty that the historical value of approved investments would be recovered, then there is scope for considerable differences in allowed WACCs.

This issue is related to the proposition that there is potential asymmetry in the expected returns in a regulatory environment. This follows to the extent that the upside return is capped or substantially restrained by the regulatory arrangements while the extent of downside protection for an investment may mean there is in effect an asymmetry that is not recognised by allowances for the cost of capital.

Appeal to the diversification property that underlies the CAPM (where diversifiable, firm specific risks are not priced) does not by itself resolve the issue. This is because for the standard CAPM to apply, investors have to be only concerned about the mean and variance of returns, or returns need to be characterised by a symmetric distribution. If returns are truncated on the upside without similar truncation on the downside then asymmetry will arise that is not priced by the standard CAPM. This issue may also arise for other aspects of the regulatory arrangements for example allowances for operating costs.

However, the regulatory arrangements may also contain various mechanisms that greatly mitigate or eliminate the scope for asymmetric downside risk. This could include guarantees that certain types of stranded assets will be recovered from allowed returns for other investments; the existence of accelerated depreciation allowances; restrictions on asset revaluations, for example restricted to misleading information or ex ante imprudence; and regulatory re-sets for unexpected developments.

There can also be situations were it may well be the case that specific aspects of the regulatory arrangements are too generous. For example some regulators and experts consider that where key components of the cost of capital do not match the term of the regulatory cycle, the NPV=0 principle will not be satisfied, with a higher WACC being allowed than is consistent with economic efficiency.

2.2 FORM OF PRICE REGULATION

Another aspect is the extent to which the form of price regulation reduces risk and requires adjustment to a range for the cost of capital that is developed without adequate consideration of the issue. For example, one issue is the extent to which rate of return regulation, as practised in the United States, entails lower risk than price cap regulation and is reflected in allowed cost of capital parameters. Another key issue is the extent to which revenue caps, revenue decoupling mechanisms and the tariff structure (allowance for fixed and variable components) affect the beta parameter in the CAPM compared with price caps that may mean less assurance of revenue recovery.

It is also relevant to note adjustments that relate to or are designed to facilitate new investment as there are precedents in the US and Europe for such adjustments.

2.3 PROCESS FOR DETERMINING RANGE FOR WACC

In some cases broad, loosely defined or indicative ranges may be identified in regulatory decisions and regulators may refer to ranges but use considerable discretion in choosing a preferred estimate. In other cases ranges may be carefully developed and defined in relatively narrow terms and in some cases well-specified decision rules might be used to define ranges.

Mostly ranges relate to the cost of equity. In the United States there are legal requirements and precedents that lead to the determination of a 'range of reasonableness' for the return on equity. The end-points of this range sometimes serve as triggers for rate reviews, or earnings sharing mechanisms. The embedded (actual) cost of debt is typically used in the United States although it is usually examined in terms of meeting prudency standards. Regulatory decisions are often prescriptive in regard to the allowed capital structure but the allowed capital structure is not usually a point of significant contention.

When the CAPM is used as the primary method for determining the return on equity the ranges have mainly related to the market risk premium and equity beta used in the CAPM. As the examples in section 3 show, sometimes a range may be considered for the risk-free rate also. In some cases uplifts may occur to the whole range and not just a mid-point, for example to allow for asymmetric risk that is not priced in the method for determining the range.

There may be other aspects of the regulatory arrangements that complicate a like-for-like comparison as noted above.

Where ranges are determined they are usually not in the form of a formal statistical distribution. They may be expressed as an interval of plausible forecasts or valid estimates. The New Zealand Commerce Commission is exceptional in that it makes use of a normal distribution and an assumed standard error[5] for the WACC to calculate a range defined by the 25th and 75th percentiles. The range is published for information disclosure regulation and a WACC based on the 75th percentile is allowed for price-quality path regulation.

Care needs to be taken in comparing reported percentiles from ranges that are not constructed in the same way. It is not possible, given the available information, to adjust all the ranges reported in this report to be on exactly the same basis.

In particular, it is not valid to compare a percentile from a normal distribution (as used by the Commerce Commission) with a "percentile" estimated from an undefined distribution on the assumption that it has a particular distribution. The form of the distribution for all of the other regulators reviewed in this report is not defined. For this reason our preferred method of comparison is in terms of a basis point uplift, the calculation of which requires no assumptions about distributions of estimates within a range. However, for the purposes of comparison with previous studies such as Castalia (2014) and Frontier (2014b) we also report percentiles on the assumption of a uniform distribution between the upper and lower bounds of a stated WACC range, since this is the implicit assumption used in those studies for calculating percentiles. However, other distributions could apply and for this reason, "percentile" comparisons can be misleading.

2.4 APPROACH FOR MAKING LIKE-FOR-LIKE COMPARISONS

It is not possible in a limited review study of this nature to review the totality of the regulatory arrangements for all of the jurisdictions reviewed in this report and make appropriate adjustments to ensure an exact like-for-like comparison. However, the decisions and methodologies that are referenced in this report have been reviewed to identify aspects of the regulatory arrangements that might affect the need to make adjustments to a CAPM based cost of capital. Notable differences in regulatory regimes that have been identified are discussed.

Given the issues in making like-for-like comparisons in terms of percentiles the primary comparison that is made is in terms of a basis point adjustment to the mid-point for a nominal vanilla WACC. It is noted that Covec (2014) in its report on behalf of BARNZ supports this approach (p.i):

> "In our view the Economic Insights work is more robust than the Commission indicates. It does not rely on any particular distributional assumptions made by the Commission and other regulators in the sample of decisions reviewed. Rather, a comparison of basis point uplifts is independently valid."

The nominal vanilla WACC is a weighted average of a nominal pre-tax cost of debt and a post-tax cost of equity (reflecting the impact of the corporate tax), with the weights reflecting the allowed capital structure. This form of the WACC is the most widely referred to in

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[5] The standard errors that are used are based on statistical information but also involve making judgements rather than the pure application of statistical techniques (New Zealand High Court 2013, para 1450, p. 482.

regulatory decisions or is relatively easy to calculate. The nominal form can be used for reasonable comparisons where inflation is relatively low and similar periods are used.

3   COMPARISONS OF WACC DECISIONS

Annex A contains a table summarising key aspects of the WACC decisions that have been reviewed in this paper.

3.1 AUSTRALIA

Australian Energy Regulator (AER)

In 2012 the Australian Energy Market Commission amended the electricity and gas rules requiring the AER to develop a guideline for setting the rate of return for regulated electricity and gas network (transmission and distribution) businesses. A detailed guideline for key parameters has been developed following an extensive consultation process (AER 2013a, b). The guideline is not binding but reasons need to be provided if AER departs from its guideline.

The National Electricity Rules require an allowed rate of return that achieves the allowed rate of return objective (AER 2013a, p. 7):

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

The guideline proposes to use a wide range of material in arriving at a point estimate of the allowed return on equity. It is proposed to use the Sharpe-Lintner capital asset pricing model to determine a starting point or 'foundation point' estimate and range for the return on equity and then use other approaches to inform the estimation of a range and preferred point estimate. It is also proposed to use a trailing average cost of debt using a simple ten year trailing average with annual updating and a transition period, over ten years, where in the first year of the regulatory period the cost of debt will be the same as the current 'on-the-day' approach.[6] The cost of debt will be based on a benchmark efficient entity. The overall rate of return is specified as a nominal vanilla WACC in accordance with the National Electricity Rules.

The parameters where a range is to be established are the equity beta, the market risk premium and the value of imputation credits. The value of imputation credits affects the cost of capital but adjustment is made to the allowed cash flows rather than the WACC when the nominal vanilla WACC is used. There was no discussion of a range for the cost of debt in the Explanatory Statement for the Guideline.

There is considerable discretion to apply uplifts to individual parameters and make adjustments for specific factors. This includes the use of regulatory judgement to allow a final estimate of the return on equity that is outside the foundation model range (AER, p. 11).

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[6] That is, the risk-free-rate estimated by the yields on government bonds over a 20-day period shortly before the date of the decision.

The guideline indicates a preference for an equity beta of 0.7 that is in the upper end of the range 0f 0.4 to 0.7.   This estimate is preferred because (AER 2013b, p. 68):

- "The Black CAPM which is an alternative to the Sharpe–Lintner CAPM predicts a higher return on equity than the Sharpe-Lintner CAPM given an equity beta from the latter that is less than 1.[7]

- Overseas results support choosing a point estimate in the upper end of the range."

The guideline indicates a preference for a market risk premium of 6.5 from a reasonable range of 5 to 7.5 per cent. This estimate is preferred based on a broad range of historical and forward looking estimates which is summarised as follows:

"Our considerations when determining the point estimate are as follows:

- Consistent with the discussion in the previous section, we give greatest consideration to historical averages. We consider 6.0 per cent an appropriate estimate of this source of evidence. This represents the starting point for our determination of a point estimate. We note that while a point estimate of 6.0 per cent is common, the choice of the averaging period and judgments in the compilation of the data result in a range for plausible estimates of about 5.0– 6.5 per cent.

- We also give significant consideration to DGM estimates of the MRP. Using our preferred application of these models, we estimate a range of 6.1–7.5 per cent.

- We give some consideration to survey estimates which generally support an MRP estimate of about 6.0 per cent.

- We also give limited consideration to conditioning variables which give mixed results at the time of this decision. Credit spreads and dividend yields are stable, while implied volatility suggests the MRP may be below the historical average at 5.6 per cent.

- Lastly, we give limited consideration to other regulators' estimates of the MRP. These generally suggest an estimate of 6.0 per cent is appropriate. The Tribunal has also affirmed several of these decisions.

We consider an MRP estimate of 6.5 per cent provides an appropriate balance between the various sources of evidence. This point estimate lies between the historical average range and the range of estimates produced by the DGM. This reflects our consideration of the strengths and limitations of each source of evidence as summarised above and expanded upon in appendix D."

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[7] The key theoretical difference relates to borrowing and lending. The Sharpe–Lintner CAPM assumes that investors can access unlimited borrowing and lending at the risk free rate. However, the Black CAPM instead assumes that investors can access unlimited short selling of stocks, with the proceeds immediately available for investment.

The data for implementing the preferred cost of debt approach is still being finalised. However, the methodology has been applied in a recent placeholder determination for a transitional regulatory control period for Distribution Network Service Providers in New South Wales and the Australian Capital Territory (AER 2014, pp. 37-38). In that determination the market risk premium and equity beta estimates from the upper end of the ranges specified in the guideline were applied, namely 6.5 per cent and 0.7 respectively. Given that data for implementing the preferred cost of debt is still being finalised a range for the cost of debt was specified of 6.7 to 7.5 per cent. Using these estimates a range for the nominal vanilla WACC of 7.6 to 8.1 per cent was identified and the upper bound of 8.1 per cent was preferred. This represented a choice at the 100th percentile of a uniform range and a 25 basis point uplift to the mid-point.

However the preferred point estimates for the market risk premium and the equity beta were used in establishing this range so that it would be reasonable to use the ranges for the market risk premium and equity beta as specified in the guideline to establish a more appropriate benchmark for comparing with other regulatory decisions. Using the ranges for the market risk premium and the equity beta from the guideline and the range for the cost of debt from the transitional decision would imply a preferred estimate at the 89th percentile and a 70 basis point uplift to the mid-point. It is noted, however, that the AER considered that the regulated businesses had overstated their proposed WACC by 40-80 basis points (AER 2014, p. 43).

Australian Competition Tribunal

As explained in section 2.1, from an economic efficiency perspective, and in particular a concern to ensure that the allowed return on investment is sufficient to ensure the financing of the optimal amount of investment the issue of asymmetric risk is relevant.

Asymmetric risk is a concept that is interpreted and applied in different ways. Although utilities sometimes argue that they face asymmetric earnings risks, regulators in Australia and New Zealand have tended to prefer that legitimate asymmetric risks be justified, quantified and included in forecast cash flows through self-insurance premia. When determining the rate of return, regulators have tended to emphasise the possibility that the community potentially faces asymmetric social welfare consequences if the return is set too high or too low. Focussing on economic efficiency effects, if the return is set too high this can impact on the decisions of customers while if the return is set too low there can be too little investment in the regulated entity which can in the limit lead to supply failures.

Issues relating to investment have received particular attention in Australia. The Australian Competition Tribunal in 2006 considered the practice of including in the allowed rate of return a premium for asymmetric risk.[8] It rejected the argument put to it that there was little detriment to over-estimating the rate of return because that would merely encourage competitive entry. Regulation is typically applied to natural monopolies in which entry is unlikely. Nor did the Tribunal accept there was necessarily a chilling effect on investment if the rate of return is set too low. Given the range of investor perceptions of the true cost of capital, and the complexity of network owner incentives, it is not reasonable to expect that

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[8] *Re Telstra Corporation Ltd (No 3)* [2007] ACompT 3 (17 May 2007) at 433–457.

investment incentives would be abruptly curtailed. While the Tribunal accepted it is possible for asymmetric consequences to follow from too high or too low a rate of return, it did not accept a presumption that overestimation always led to a lesser social cost than underestimation. It suggested that a claim of asymmetric effects should be supported by evidence, such as a social cost-benefit analysis and with support for the specific adjustment made to the rate of return.

Economic Regulation Authority (ERA) (Western Australia)

The ERA published revised guidelines for determining the rate of return for gas transmission and distribution networks, under the National Gas Rules, in December 2013. A comprehensive review and consultation process was undertaken in preparing the guidelines. The guidelines are also being used for establishing an allowed rate of return in other sectors.

The CAPM is the primary model for determining the return on equity with cross checks from other approaches. In the guidelines, ranges are estimated for the market risk premium and equity beta. Choices for specific decisions will reflect assessment of range of relevant estimates, a view that estimates of beta below one have a downward bias and consideration of specific factors for each regulated entity. The debt risk premium and gearing will be based on an observed sample of comparator firms with a similar credit rating and will be updated annually. The risk free rate will be set once at the start of the regulatory period based on a term of 5 years to match the regulatory period and satisfy the NPV=0 principle. The National Gas Rules stipulate that a nominal vanilla WACC must be used in specifying the allowed rate of return.

The methodology was applied to obtain an indicative result for gas transmission and distribution of a WACC at approximately the mid-point of the range (ERA 2013a). The deviation from the mid-point reflected the combination of a market risk premium below the mid-point and an equity beta at the top of the range.

The methodology was also applied in a recent decision for three freight and urban railway networks (ERA 2013b). No ranges were reported in this decision but the market risk premium was below the mid-point of a range reported in the Issues Paper for the decision (ERA 2013c).

Essential Services Commission (ESC) (Victoria)

The ESC's most recent cost of capital determination was for Victoria's urban water businesses in 2013. Because these businesses are all government owned, the WACC is not a contested issue, and it was addressed in less than 10 pages of the final decision (ESC 2013, pp.102-111). The ESC indicated it would undertake a more detailed review of the WACC methodology prior to the next review.[9]

The ESC decision specified a nominal vanilla WACC of 10.35 per cent, which is 20.5 basis points above the mid-point of the indicated range or the 62nd percentile of a uniform

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[9] This has commenced. See: http://www.esc.vic.gov.au/Water/Financial-Viability-Review

distribution. Point estimates for the equity beta, market risk premium, financing structure and value of imputation credits were all the values used in its previous review, without re-examination.

An approach often used by Australian regulators is to adopt 'conservative' estimates for certain parameters in the WACC formula. 'Conservative' means, in this context, erring on the high side. The combined effect is to set the allowed cost of capital in the upper part of the most likely range of true values. An example of this approach is the Essential Services Commission's (ESC) determination of the cost of capital for three Victorian gas distribution businesses in 2008. Table 3 shows the ESC's assessment of the feasible range of values for each of the WACC parameters, and its final decision on each parameter (ESC 2008, p.446).

Table 3: **Summary of ESC Final Decision: Cost of Capital Gas Distribution Businesses 2008**

	Low	**High**	**Mid**	**Decision**
Real risk-free rate	6.15%	6.15%	6.15%	6.15%
Debt premium	2.075%	2.145%	2.11%	2.145%
Market risk premium	4.00%	7.00%	5.50%	6.00%
Equity beta	0.5	0.8	0.65	0.7
Debt:Equity	60:40	60:40	60:40	60:40
Inflation	2.70%	2.70%	2.70%	2.70%
Nominal vanilla WACC	8.23%	9.71%	8.97%	9.15%

Source: Authors' calculations based on ESC (2008)

The overall effect of choosing parameter values from the upper part of the ranges, for the ESC's 2008 gas distributor decision, had the effect of uplifting the WACC by 18 basis points 62nd percentile for a uniform distribution) compared to its value if midpoint parameters were chosen.

It is worth noting that the approach of adopting conservative values of selected WACC parameters can encourage costly appeals where there is a merits review process, depending on the potential scope of the merits review. It can provide incentives for 'cherry picking' in which regulated businesses challenge those elements of the WACC that are less favourable, while retaining all of the benefit of 'conservatively' estimated (and hence unchallenged) parameters. It can also complicate the exercise of establishing estimates and ranges for WACC parameters and the application of regulatory judgement in establishing a reasonable cost of capital that balances the various objectives of the regulator.

Independent Pricing and Regulatory Tribunal (IPART) (New South Wales)

IPART has revised its approach to determining the WACC (IPART 2013). The methodology set out in the base approach involves setting a feasible WACC range based on a range from long term averages and current market data for the market risk premium and cost of debt. A point estimate of the equity beta is specified in the base approach but a range was used in a recent rail access pricing decision (IPART 2014). A range for gearing was also used in the rail decision.

From this WACC range, the point estimate from the WACC range is chosen using a decision rule based on an 'economic uncertainty' index using financial measures of volatility and dispersion of returns. If the uncertainty index is within 1 standard deviation from the long term average of zero, the mid-point WACC is selected, otherwise there is discretion to choose a different point estimate.

The rail access pricing decision provided a preferred nominal vanilla WACC of 9.0 per cent with no uplift as the uncertainty index was within one standard deviation of the long term average for the index. IPART's current approach is a significant departure from its previous practice of normally setting the WACC at above the midpoint of its estimated range.[10]

Queensland Competition Authority QCA

The QCA is undertaking a comprehensive review of its cost of capital methodology. Past practice has been to choose the mid point or median of a reasonable range for certain specific parameters (market risk premium, equity beta and dividend imputation allowance) and best point estimates of other parameters. Following a review in 2004 an important change was to use a term for the risk free rate that matched the period of the regulatory cycle (Lally 2004).

The main focus in terms of ranges is for the market risk premium. The QCA's recent practice has been to form a point estimate of the market risk premium using the median from four different methods and rounding to the nearest whole per cent (QCA 2012). Using this approach an estimate of 6 per cent has been used for the market risk premium for the past decade or so. By using several estimates (that are not perfectly correlated) from valid methods, the resulting pooled estimate will have a standard deviation that is lower than the standard deviation from an estimate generated by a single method. However, in its most recent decision on the market parameters (risk free rate, market risk premium and dividend imputation) the QCA (2014a) has raised its estimate of the market risk premium to 6.5 per cent based on wider range of evidence including prevailing conditions.

The QCA and other Australian regulators estimate the equity beta for a regulated firm with reference to other firms with, in principle, similar underlying determinants of relevant risk. Estimates of the asset betas of comparable firms are pooled to obtain a possible range. In general, past practice has been to select the midpoint of the range without further adjustment. However, there is scope to take account of how specific factors affect relevant risk for the regulated firm, like the form of regulation (QCA 2012 b, c). For example (QCA 2012c, pp. 492-493):

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[10] For example by 60 basis points in IPART (2009, pp. 40-43.)

"Moreover, the regulatory setting for SunWater's irrigation activities would also contribute to low exposure to systematic risks and therefore a low asset beta. To a large extent, SunWater's irrigation activities are shielded from both demand and cost risk. In particular, the adoption of a two-part tariff with a fixed component that is designed to ensure the recovery of expected fixed costs, and where there is a reasonable assurance that actual variable costs can also be recovered, in large part eliminates revenue adequacy risks for SunWater – though some risks do remain.

In these circumstances a reasonable case can be made that the equity beta is likely to be very low.

Notwithstanding NERA's (2011) interpretation that there is little evidence to suggest that differences in the regulatory environments that firms face produce material differences in their betas, the Authority's view is that this issue is far from resolved.

Alternative views to NERA's are held by Dr Lally (2011), who has previously advised the Authority that certain companies with regulatory settings similar to that proposed for SunWater have very low systematic risk. These entities have low exposure to both demand and cost shocks as they are subject to revenue cap regulation or similar, with regulatory reset triggers for unforeseen circumstances. They include certain UK water entities (average asset beta of 0.22) and Australian energy network companies (average asset beta of 0.3).

An asset beta of 0.3 lies below that applied in other recent water industry regulatory decisions by the Authority, including 0.4 for GAWB (QCA, 2010), and 0.35 for South East Queensland (SEQ) retail water providers (QCA, 2011). As GAWB supplies mostly industrial customers, and the SEQ entities supply urban customers, both are considered to have higher systematic risk profiles than SunWater's irrigation activities.

. . .

After taking into account all of the above, the Authority considers that an asset beta of 0.3 is appropriate for SunWater's irrigation business. This translates as an equity beta of 0.55 using the Authority's leverage formula, an assumed debt beta of 0.11, and a debt to value ratio of 0.6. In turn, with a risk-free rate of 3.89% per annum and a MRP of 6% per annum, this yields a return on equity of 7.19% per annum."

The QCA's most recent regulatory decision on WACC (QCA 2014b) is for vertically integrated urban water businesses subject to price monitoring. It provides a point estimate with no range. The decision draws on an earlier price monitoring report (QCA 2011) where a market risk premium of 6 per cent is used and it is recognised that firms subject to price monitoring will have a higher beta than firms subject to revenue caps but lower than for firms subject to price caps, highlighting the relevance of the form of regulation for setting a WACC (p. 246):

"Noting that the SEQ entities are subject to price monitoring, Dr Lally noted that commercial prudence would incline them to raise prices in response to upward cost shocks, while their monopoly power would permit them to do so. Fear of price control would incline them to reduce prices in response to downward cost shocks. Thus, the

SEQ firms should have asset betas above revenue capped firms, less than price capped firms, and similar to rate of return regulated firms. Estimates from all these regimes are therefore useful."

3.2 EUROPE

Denmark

The WACC is not used for the regulation of electricity distribution. The return is capped at the 30 year mortgage rate plus 1 per cent. The nominal capped rate was 7.5 per cent in 2008. There are additional financial incentives to reduce grid losses.

Finland

A point estimate is used for the WACC for the determination of a revenue cap for electricity distribution and transmission. A 5 per cent market risk premium and a 0.5 per cent uplift for a liquidity constraint are allowed. Efficiency incentives enable additional returns capped at an additional 3 per cent uplift to the WACC. A fixed estimate of inflation of 1 per cent is used to calculate the risk-free rate.

France

For price control for gas transmission a point estimate of the WACC is specified based on an undisclosed range. The nominal vanilla WACC for 2013-16 is 6.5 per cent. A 3 percentage point premium over 10 years is allowed for certain network integration (an previously main network expansion) projects. There is also a provision to allow the recovery of stranded assets and for productivity incentives.

For price control for electricity transmission and distribution a point estimate is also specified based on an undisclosed range. There are also provisions for productivity incentives.

Netherlands

A revenue cap with productivity incentives is specified for the electricity transmission grid. The mid-point of a range is used for a WACC but with undisclosed conservative estimates of the parameters.

Portugal

Price control for various telecommunications services assumes a mid-point WACC which is updated annually.

Sweden

A revenue cap for electricity transmission specifies the application of a WACC which is effectively the mid-point of two ranges proposed by consultants.

3.3 UNITED KINGDOM

Competition Commission

A recent final determination of the Competition Commission (2014) in relation to setting a price cap for Northern Ireland Electricity (NIE) (transmission and distribution) provides a detailed presentation of its latest views on an allowed rate of return for regulatory price setting purposes. The general approach is to base the price cap on the revenue required by an efficient licence holder to cover its efficiently incurred costs, including a return on its regulatory asset base. This is considered to be in the public interest.

The CAPM was the main model used for the cost of equity and the Competition Commission. Ranges were specified for the real risk free rate, market risk premium, and equity beta. A range for the real risk free rate of 1 to 1.5 per cent was considerably higher than indicated by current market conditions. NIE argued for a premium to the standard CAPM to reflect higher risk but Competition Commission did not approve such a premium.

The Competition Commission allowed the cost of embedded debt based on NIE's actual debt, with appropriate consideration of whether it had been incurred prudently and efficiently through examination of the yield on NIE's bond and comparable bonds issued by GB electricity distribution companies. This included an apparent premium for NIE debt compared with benchmarks.

However, the Competition Commission adopted the upper end of the range noting that the preferred inflation estimate of 3.25% (based on Office of Budget Responsibility estimates) may be interpreted as at the upper end and a lower forecast would increase the real cost of debt, consideration of credit metrics and consumer impacts and the evidence as a whole.

The Commission noted its estimate was comparable to recent Ofgem decisions but lower than its reports from 2007 to 2010. In earlier decisions in relation to airports (Competition Commission 2007, p.4) the Commission chose estimates in the upper part (85th or 88th percentile of uniform distribution) of the range noting the uncertainty in the estimates and avoiding a rate of return that is insufficient to generate necessary new investment that would be of significant benefit to airlines and passengers.

Ofcom

Ofcom (2014a) sets out the regulatory policies it is introducing in the UK fixed access markets for certain telecommunications services. Ofcom (2014 b, c) provides details of the allowed cost of capital in allowing charges for access to certain parts of BT's copper network (operated by Openreach). The decision made extensive reference to the recent Competition Commission (2014) for NIE transmission and distribution.

Ofcom calculated the cost of capital for BT as a whole and then 'split' the WACC into WACC for the copper network and the rest of BT. This entailed disaggregating the component parameters of the WACC. A real risk free rate of 1.3 per cent applied to both components of BT. All parameters reported for the copper network were point estimates but the market risk premium of 5 per cent was at the high end of a reported range, consistent with the estimate preferred by the Competition Commission (2014).

Using a range for the market risk premium of 4-5 per cent the preferred estimate was at the top of the range implying an uplift to the mid-point of 23.5 basis points.

Ofgem

Ofgem recently started its price control review for the price control period starting on 1 April 2015. In its most recent decision on the methodology for assessing the return for price controls for electricity distribution companies (Ofgem 2014) used an estimate of the rate of return on equity that was at the bottom of an indicative range of 6-7.2 per cent (in post tax real terms) specified in the Ofgem (2013) Strategy decision for the electricity distribution price control, as specifically noted by Ofgem in referring to its Strategy Decision and what was used to assess the business plans (2014, p.4).

Ofgem (2014, pp. 3-4) referred to the recent analysis and decision of the Competition Commission (2014) for Northern Ireland Electricity,[11] the weight given to current market conditions and the preferred range of 5.5 to 6.5 per cent for the rate of return on equity in the Commission's decision. Ofgem referred to its historical approach of basing the equity market return on long term data and noted that it was changing its methodology to give greater weight to the influence of current market conditions in relation to the equity market return. Ofgem did not explicitly say that it had revised its range for the cost of equity but noted (p.4):

> "Bearing all these factors in mind leads us to reduce our central reference cost of equity by 0.3 per cent to 6.0 per cent. This is the bottom of the range for the cost of equity we set out in our Strategy decision."

The nominal vanilla WACC that was implied by this decision was some 22 basis points below the mid-point of the range constructed from the range for the cost of equity specified in the Ofgem (2013) Strategy Decision. However, if the range of the Competition Commission was used then the Ofgem decision was consistent with using the mid-point of this range.

This decision contrast with earlier decisions by Ofgem (2012) for price controls for gas and electricity transmission were preferred estimates for a nominal WACC were at the 67th and 83rd percentiles (assuming a uniform distribution) or 7.7 and 15.5 basis points respectively above the mid-point. Note that in these decisions a range of the post tax real cost of equity of 6-7.2 per cent was specified, the same as in the Ofgem (2013) Strategy Decision. The preferred cost of equity was 7.0 per cent for electricity transmission and 6.8 per cent for gas transmission (Ofgem 2012, p. 11 and p. 24).

Note that Ofgem uses a trailing average cost of debt approach for the debt component of the WACC which reduces risk for the regulated entity, provided the entity issues debt consistent with the index-based benchmark.

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[11] The Competition Commission is the appeal body for Ofgem decisions.

Ofwat

Ofwat is in the process of undertaking a review for price controls for 2015-20. For its determination for prices for 2010-15 it approved a nominal vanilla WACC of 8.5 per cent, representing an 87.8 basis points uplift on the mid-point of a range. Small companies were allowed higher returns of 8.7 (two) and 8.9 (others).

Ofwat (2008, p. 127) noted:

> "In its advice, Europe Economics provided a 'marked up' range to take account of asymmetric consequences associated with the risk to customers of setting the cost of capital too low. This mark-up was applied to the overall cost of capital, not individual components. … The width of the range reflects the uncertainty around estimating the cost of capital, particularly in the context of the current markets."

The range also reflected ranges for gearing, risk free rate, beta, equity risk premium and cost of debt.

In providing its reasons, Ofwat, p. 128 noted:

> "Our final determination cost of equity is at the high end of the Europe Economics pre- marked-up range (3.5% to 7.2%), but we believe that it is necessary to allow the industry to maintain access to finance in difficult economic times. This takes into account general expectations that current economic conditions will continue in the early part of 2010-15 and the need to ensure the cost of equity is sufficient to both keep equity in the sector and attract new equity."

Note there are various mechanisms for limiting risk including interim determinations triggered by specific events and substantial effects provisions. However, for this review companies were required to revalue their assets based on a modern equivalent basis (p.116). It was expected this would lead to lower estimates of current cost depreciation but this increased for about half the companies. Deductions were made for these companies. The revaluation of assets was undertaken to establish current depreciation allowances and not to revalue the regulatory capital value which was originally set at the value placed on the company's capital by the markets at the time of privatisation (Ofwat 2010).

3.4 UNITED STATES

Federal Communications Commission (FCC)

Most of the revenues of regulated telecommunications businesses in the United States are regulated under price cap regimes where a maximum rate of return is not specified. Price cap regimes have applied for local carriers in almost all States since the late 1990s. However some local exchange carriers (around 1200 but accounting for 5% of total regulated revenues) are subject to rate of return regulation where an authorised rate of return is prescribed by the FCC. The same authorised return applies to all rate-of-return regulated carriers. The authorised rate of return is used to determine interstate common line rates and special access rates for incumbent local exchange carriers.

An authorized rate of return is also specified to determine the support incumbent local exchange carriers (including those regulated under a price cap regime) receive from the Universal Service Fund for high cost local loop support and interstate common line support (FCC 2013).

The FCC last prescribed an authorised rate of return, in the form of a weighted average cost of capital, in 1990 reducing it from 12 to 11.25 per cent. This rate of return still formally applies to rate-of-return regulated carriers. However, a materially lower rate of return has recently been recommended by the Wireline Competition Bureau in a Staff Report (FCC 2013). The Staff Report was prepared to assist the FCC as it considers prescribing a new authorised rate of return.

The Staff Report notes that there have been substantial regulatory and market changes since 1990 that need to be considered in re-prescribing an authorised rate of return. The Staff Report calculates a zone of reasonable WACC estimates ranging from 7.39 to 8.72 per cent. However, it concludes the FCC should consider establishing the authorised rate of return in the upper half of this range, being 8.06 to 8.72 per cent. The mid-point of this range would be the 75th percentile of uniform distribution. Estimates were obtained using both CAPM and DCF models and applying capital structures based on market values, with an average debt to equity ratio of 54:46. The rationale for using the upper half of the range was based on an assessment of liquidity or credit worthiness (measured by times earnings covered interest obligations ratios) and recognising the historically low interest rates and infrequency of re-prescription.

The methodology for determining an authorised rate of return in the Staff Report has been used in an FCC final order that applies to all price cap regulated carriers to determine support in relation to maintaining universal voice service and expanding broadband service (FCC 2014). The order concludes that applying the Staff Report methodology to the data from the price cap carriers yields a zone of reasonableness for a nominal vanilla WACC of 7.84 to 9.20 per cent, with a preference for approximately the mid-point of that range. Note that this range is effectively the upper half of a full range of reasonableness and was preferred as it would effectively be locked in for five years and the data used to calculate the zone of reasonableness reflects a time of historic lows (FCC 2014, para 107).

The Federal Energy Regulatory Commission (FERC)

FERC sets an authorised rate of return on equity for electricity transmission networks and natural gas pipelines that cross state boundaries. State regulators set authorized rates of return on equity for energy distribution networks within State boundaries. There is a focus on the rate of return on equity (with reference to entities with a similar credit rating) since there is acceptance of allowing the embedded (actual cost of debt) in regulatory decisions. Although evidence is presented based on the CAPM and other approaches the DCF approach is the main methodology used by FERC.

A recent initial decision by a FERC administrative law judge (FERC 2013a, EL11-66-001) and order on the initial decision by FERC (FERC 2014) provide useful information on primary source standards and precedents for setting a rate of return on equity as well as

current information for setting an appropriate authorised rate of return for the electricity transmission network in six New England States. These decisions are summarised here.

According to FERC staff testimony, the primary source standards specify that the rate of return on equity should be sufficient to maintain the financial integrity of the utility, allow it to raise capital necessary for the discharge of its mission to provide efficient and economical electric service to the public and compensate investors for the risk they assume. However, these considerations also need to be balanced by public interest considerations against excessive rates (FERC 2013, EL11-66-001, pp. 76-77).

FERC applies a DCF formula to each member of a group of comparable utilities, known as a proxy group. This generates a range for the return on equity. Screening criteria are used to remove low and high end outliers to establish a 'range of reasonableness' for the return on equity. The return on equity for the entity or entities under consideration is selected within this range.

Until 2008, FERC used the mid-point to establish the base return on equity for both individual electric utilities of average risk and diverse-risk utilities filing jointly. However since 2008 FERC has used the median for a single utility of average risk and until recently the mid-point for electric utilities applying jointly as a group. In contrast under the Natural Gas Act it has long used the median to set the return on equity, concluding that the median gives more consideration to more of the companies in the proxy group.

The last base level rate of return of equity for all Regional Transmission Operators (RTO) in New England was set in 2006 at 10.2 per cent and updated in 2008 to 11.14 per cent, based on the mid-point of a zone of reasonable returns for the return on equity. The methods used in the case of New England have been used for other Regional Transmission Operators across the US but according to FERC staff testimony no other decisions have been made for a single RTO-wide return on equity since 2006.

The judge for the recent initial decision found that the current base return on equity of 11.14 per cent was not just and reasonable, and that the zone of reasonableness was 6.0 to 15.2 per cent for a refund period and 6.1 to 13.2 per cent for the prospective period, with base rates set at the mid-points being 10.6 and 9.7 per cent respectively (FERC 2013, EL11-66-001, p. 134 and 150).

However, in June 2014, FERC issued Opinion No. 531, which details several significant changes to the way FERC determines the rate of return on equity in public utility cases. The change that is most relevant entails setting the return on equity at the point halfway between the range's point of central tendency and the range's highest point (the 75th percentile), which FERC (2104, para 151) described as the "central tendency for the top half of the zone of reasonableness.Using a modified DCF methodology the FERC (2014) order determined a zone of reasonableness of 7.03 to 11.74 per cent with a mid-point of 9.39 per cent and a preferred estimate of 10.57 per cent for the return on equity, which represented the mid-point of the upper part of the range for the return on equity (75th percentile assuming a uniform distribution). FERC explained its primary concern that led to this decision as related to anomalous capital market conditions as follows (FERC 2014, para 145):

"We are concerned that capital market conditions in the record are anomalous,

thereby making it more difficult to determine the return necessary for public utilities to attract capital. In these circumstances, we have less confidence that the midpoint of the zone of reasonableness established in this proceeding accurately reflects the equity returns necessary to meet the *Hope* and *Bluefield* capital attraction standards."

The specific standard quoted was (FERC 2014, fn 282):

"The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties."

FERC (para 15) also noted that this order did not preclude other points in the range of reasonableness being adopted in other pending proceedings in relation to the return on equity.

FERC (para 153) also explained that its decision involved considerations that are distinct from the scope to provide "incentive adders" to the base return on equity related to Section 219 of the Federal Power Act.

In addition to a base rate of return, there was provision, in the initial decision, for uplifts to provide incentives for investment expansion (150 basis point for expansion and 50 basis point for participation in a regional transmission organisation in place and recommended to continue in this New England case). The FERC 2014 order did not address this issue.

The scope for incentive uplifts to the return on equity were put in place following the introduction of incentive-based rate treatments as directed by the Energy Policy Act of 2005 which added a new Section 219 to the Federal Power Act. The incentive arrangements allow uplifts to the return on equity for new investment to alleviate congestion, for advanced technology, for specific risks and complexity and for membership of a regional transmission organisation or for being an independent system operator. In addition, there are various specific provisions to allow for full recovery of various costs including prudently incurred construction work in progress and prudently incurred costs of abandoned facilities and flexible depreciation provisions.[12]

There have been numerous decisions implementing these incentive arrangements leading to material uplifts to the authorised rate of return. A prominent example is the approval of 250 basis points uplift for an offshore transmission Atlantic Grid along with approval of 100 per cent construction work in progress and abandoned plant recovery and other incentives. The uplift included 100 basis points for the relative complexity and risks of the projects and 50 basis points for each of member of a Regional Transmission Organisation, Transco status and the use of advanced technologies.[13]

However, FERC is in the process of reviewing its approach to implementation of the transmission rate incentives. It has issued a detailed policy statement explaining a change to its approach to implementation of the transmission rate incentives.[14] According to the policy

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[12] http://www.ferc.gov/industries/electric/indus-act/trans-invest.asp

[13] http://www.ferc.gov/whats-new/comm-meet/2011/051911/E-7.pdf

[14] http://www.ferc.gov/industries/electric/indus-act/trans-invest.asp

statement, a more focussed and rigorous case will need to be made to support proposals for incentive allowances. This will include no longer relying on a simple nexus test of whether the project is routine or not routine, no longer considering a separate uplift for new technology and applicants showing that they have taken all reasonable steps to mitigate risks. The policy statement recognises that the provision of other incentives such as recovery of abandoned assets would impact on the rate of return required to support investment. In addition the policy statement states that it is expected that applicants for an incentive uplift to the return on equity would commit application to a certain estimated cost.

State regulators

State regulators in the United States have a range of responsibilities in relation to economic regulation of entities operating within their borders. The examples presented here all relate to energy utilities.

Some states provide detailed documentation and reasons while some provide minimal information. In some cases allowed returns are the outcome of a negotiation that is approved by the regulator. The precedents are discussed in FERC (2013a) and several State regulator decisions. They in effect refer to the need to ensure a return commensurate with relevant risks and maintain the financial integrity of the regulated entity while avoiding above normal profits.

PPUC (pp. 56) provides the following interpretation:

> In deciding this or any other general rate increase case brought under Section 1308(d) of the Public Utility Code (Code), 66 Pa. C.S. § 1308(d), certain general principles always apply. A public utility is entitled to an opportunity to earn a fair rate of return on the value of the property dedicated to public service. Pa. PUC v. Pennsylvania Gas and Water Co. 341 A.2d 239, 251 (Pa. Cmwlth. 1975). In determining a fair rate of return, the Commission is guided by the criteria provided by the United States Supreme Court in the landmark cases of Bluefield Water Works and Improvement Co. v. Public Service Comm'n of West Virginia, 262 U.S. 679 (1923) and Federal Power Comm'n v. Hope Natural Gas Co., 320 U.S. 591 (1944). In Bluefield, the Court stated:
>
>> A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties; but it has no constitutional right to profits such as are realized or anticipated in highly profitable enterprises or speculative ventures. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties. A rate of return may be too high or too low by changes

affecting opportunities for investment, the money market and business conditions generally.

Bluefield, 262 U.S. at 692-693.

The focus in terms of ranges and adjustments is on the return on equity. Regulators tend to allow the embedded cost of debt and the capital structure is typically not a contentious issue. As well as making judgements in relation to the key legal precedents adjustments can be made to provide incentives for efficient management and investment and to reflect how the form or regulation may reduce risk.

States that authorised returns materially[15] above the mid-point

In a recent decision that related to four electricity and/or gas distribution businesses the California Public Utilities Commission authorised returns that ranged from the 76th to the 88th percentile or an uplift to the mid-point of 10.5 to 16 basis points. The range reflects best estimates based on different methods rather than a confidence interval. The preferred estimate was based on an assessment of what was justified to assure confidence in the financial soundness of the businesses while balancing the interests of shareholders and rate payers.

The Indiana Utility Regulator approved a rate of return at the 70th percentile representing an 8.5 basis points uplift to the mid-point. This estimate is higher than the mid-point of the range of reasonableness estimated by the regulator but represents the mid-point of ranges from the parties to the decision.

The Pennsylvania Public Utility Commission authorised a rate of return for electricity distribution that was at the 64th percentile representing a 14 basis points uplift to the nominal vanilla WACC. The uplift was allowed to recognise a management effectiveness incentive and the need to fund substantial improvements in the network.

The State of New York Public Service Commission 2014 order in relation to electricity, gas and steam was an approved negotiated agreement which entailed uplifts to the nominal vanilla WACC of 19 to 24 basis points.

States authorising returns at or near the mid-point

State regulators that authorised returns at or near the mid-point in recent decisions include: District of Columbia, Georgia Public Service Commission, Florida Public Service Commission and the Public Service Commission of Maryland.

The District of Columbia Public Service Commission made an adjustment of 50 basis points to the return on equity to recognise the lower risk associated with a bill stabilisation adjustment that reduces revenue risk. This adjustment was made to the range but if only the mid-point was adjusted this observation would be materially below the mid-point.

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[15] This is interpreted to be more than the 55th percentile.

States authorising returns materially[16] below the mid-point

The Massachusetts Department of Public Utilities authorised a rate of return for electricity distribution at the 34th percentile, representing a 7 basis points deduction from the mid-point. There was an unspecified adjustment to recognise the lower risk from de-coupling revenue from cost. The range was not adjusted.

North Carolina Utilities Commission in an approved negotiation provided an estimate at the 45th percentile, representing a 2.5 basis points deduction from the mid-point.

Other States

The Illinois Commerce Commission is subject to a statutory requirement that the return on equity be set equal to the average 30 year US treasury bond yield plus 5.8 percentage points.

The rate of return was agreed by negotiation in Ohio and the method of calculation was not disclosed.

The State of New York Public Service Commission 2009 order for electricity and gas delivery service did not disclose a range of reasonableness.

3.5 SOME OBSERVATIONS ON THE COMPARISONS

The New Zealand Institute of Economic Research (NZIER 2014, p.1) in its submission to the WACC review presented its view that there was:

> "an emerging practice overseas with respect to reducing the regulatory WACC which now makes the Commission's current IMs something of an outlier"

In response, Frontier Economics (2014a, p. v) in its report prepared for Transpower claims that there are many examples of regulators in the United Kingdom allowing rates of return well above the mid-point of the WACC range and that there has been no shift in regulatory practice of the kind claimed by NZIER. Frontier Economics also discusses a number of aspects of the regulatory arrangements that it considers are likely to mean the Commerce Commission's approach is less generous to regulated entities than is the case in the United Kingdom.

Frontier Economics (2014a, p. 4) presents the results from 13 decisions of UK regulators since 2005. Three of them correspond to three of the eight UK decisions reviewed in this report. All of the decisions reported by Frontier Economics provide examples of preferred estimates well above the mean with being above the 75th percentile.

However, there are a number of issues in the presentation of these results.

- Although other regulators did not specify the distributional properties the percentiles that are estimated in effect assume a uniform distribution and cannot be directly compared to the percentiles from a normal distribution as is used by the Commerce Commission. A uniform distribution assumes that every point in the range has the

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[16] This is interpreted to be less than the 45th percentile.

same probability of occurrence where as a normal distribution relates probabilities to specific estimates based on their frequency of occurrence as calibrated by a normal distribution with a defined standard error. To highlight the point the 100th percentile cannot be defined with a specific estimate for a normal distribution. This issue and Frontier's subsequent response are discussed further in Section 4.

- It is not clear that all of the WACCs reported in Table 1 (p.4) are defined in the same way. The WACC ranges for the Competition Commission decisions on Heathrow (4.77-6.39) and Gatwick (4.91-6.77) airports are defined as real pre-tax WACCs (Competition Commission 2007, p. 49). The corresponding real vanilla WACCs are 4.03-5.20 and 4.13-5.47 and are considerably narrower. In contrast the Competition Commission decision for Northern Ireland Electricity in Table 1 is defined in real vanilla WACC terms (Competition Commission (p. 13-2 and 13-38). If a percentile approach is used this may not matter but as noted an approach based on direct comparisons of basis points uplift to the mid-point is considered preferable given that other regulators do not specify the distributional properties of the ranges that they report.

  The estimation of WACCs in nominal Vanilla terms results in a lower range for the WACC for most UK decisions compared with decisions by the New Zealand Commerce Commission. The average range of the WACC decisions from Table 2 is about 1.6 percentage points. The average range from the United Kingdom decisions reported in Table 4 is about 1 percentage point and if Ofwat is excluded the range is about 0.76 percentage points. The difference in the ranges highlights the issue of not knowing the distributional properties of the ranges which also means that the width of the range cannot be assumed to reflect the degree of confidence in the estimates. Comparison of the results in Table 1 with those in Table 2 of this report (in the Executive summary) suggests that, in terms of a basis points adjustment to the mid-point of the range, the adjustments by the Commerce Commission are on average markedly higher than for the regulatory decisions in most other jurisdictions, including the United Kingdom.

- It is also noted that although the UK Competition Commission in its most recent decision chose an estimate at the 100th percentile of a uniform distribution, it noted its estimate was comparable to recent Ofgem decisions but lower than its reports from 2007 to 2010.

- In addition it is notable that Ofgem has also adopted a lower estimate than in previous decisions and in its most recent decision adopted an estimate that was some 22 basis points below the mid-point of the range for the nominal vanilla WACC based on choosing the lowest point of the range for the cost of equity, presented in its strategy consultation paper. However, it is noted that if the range of the Competition Commission was used then the Ofgem decision was consistent with using the mid-point of this range.

The review of recent developments in the United States points to a mixed picture. Lower rates of return are being considered and recommended but practice in relation to approving rates of return above the mid-point of a reasonable range varies considerably. A recent

FERC decision overturns precedent to prefer the mid-point of the upper part or a range of reasonableness for the return on equity. However, a FERC policy paper proposes a tighter regime for approval of uplifts to a return on equity for specific risks or investment incentives for electricity distribution and transmission.

In Australia, IPART's current approach of using an uncertainty index is a significant departure from its previous practice of normally setting the WACC at above the midpoint of its estimated range.

However, it should also be noted that there are some aspects of the regulatory arrangements and cost of capital methodology in New Zealand that are likely to mean that if applied in the United Kingdom without changing other aspects of the regulatory regime would tend to lower the allowed cost of capital. Frontier Economics (2014a) identifies the following features in the United Kingdom as providing more generous allowances than in New Zealand: 'headroom in risk-free rate determinations'; term of the risk free rate not corresponding to the regulatory cycle; joint treatment of the risk free rate and market risk premium taking account of the scope for an inverse relationship; and on-the-day specification of the cost of debt. We do not disagree with the direction of the effects that might arise from these features. However, it is still the case that there is evidence of a less generous approach in some recent regulatory decisions in the United Kingdom, reflecting changes in market conditions.

4 RESPONSES TO SUBMISSIONS

This section responds to key comments in several submissions in relation to the Economic Insights report dated 16 June 2014.

4.1 COMPETITION ECONOMISTS GROUP ON BEHALF OF WELLINGTON ELECTRICITY

Competition Economists Group (CEG) (2014a, b) prepared reports on behalf of Wellington Electricity. The most recent CEG report (2014a):

- summarises the earlier report, noting its interpretation that other regulators (US[17], UK, AER) have allowed rates of return that imply a risk premium that is 1.7 to 2.4 times the mid-point of the Commission's mid-point of its preferred range;

- argues that the issue of selecting an uplift over the mid-point of a range cannot be separated from the issue of considering the most appropriate mid-point estimate; and

- responded to a number of specific responses by the Commission to the earlier report.

The response below focuses on the main points.

The Commission's draft decision responded to the initial CEG report (2014b) noting that there were comparability issues with the CEG interpretation and in particular that the WACC estimates from other regulators incorporate long term averages of the risk free rate while the Commission uses a spot rate estimate. The Commission also noted that different tax treatments needed to be accounted for and referred to the market value to RAB premium for Powerco as evidence that the allowed rate of return was more than sufficient to attract investors.

CEG agreed that the WACC estimates for the UK and US incorporate long term averages for the risk free rate and made adjustments in calculating the mark ups over the risk free rate for the estimates reported in Table 1 of both its reports. This in effect allows for a comparison of mark ups over a mid-point of the WACC, on the same basis, assuming the regulatory arrangements are otherwise equivalent and all estimates are in the same form in terms of tax and nominal or real magnitudes.

It is also relevant to note that the AER decision referred to, used a spot rate for the risk free rate and that of most regulators in Australia use a spot rate averaged over a short period prior to when the decision is to be made. However, the AER (2013a,b) has recently adopted a trailing average approach for the cost of debt which in effect uses a medium to long term average for the risk free rate embedded in the cost of debt for that component of the WACC, while still using a spot risk free rate as a component of the cost of equity.

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[17] The United States estimates were based on "52 (7) different US electric utility regulatory decisions made by 31 (7) different state based regulators since 1 January 2013 (1 January 2014)" and sourced as "Source: Regulatory decisions, Bloomberg, SNL and CEG analysis" but detailed information was not provided.

Many regulators form a view of an appropriate overall WACC by considering various methodologies but typically have a central methodology as a reference point. For example the CAPM is typically the central methodology for calculating the cost of equity in Australia, New Zealand and the United Kingdom but often supplemented by other approaches such as the dividend discount growth model. In contrast, FERC in the United States has relied mainly on the dividend discount growth model. In addition, regulators may adopt different approaches for recognising and pricing recent developments or specific aspects of risk that are not captured by the standard CAPM and considered relevant. The form of regulation, including cost pass through provisions and its impact on risk can also have implications for the allowed rate of return.

These issues were discussed in Section 2 and highlight the difficulties in making like-for-like comparisons of regulatory rates of return across jurisdictions. They also highlight the importance of using supplementary information to determine if efficient investment has occurred in the jurisdiction under consideration and whether the market value of a regulated entity equals or exceeds the value of the regulatory asset base. If it can be reasonably demonstrated that the allowed rate of return is commensurate with rates of return that have not precluded efficient investment, then arguments that allowed rates of return are clearly higher in other jurisdictions do not provide a rationale for not reducing the allowed rate of return for the jurisdiction under consideration. The evidence the Commission provided with respect to market value to RAB multiples is considered to support the view that allowed rates of return exceed what is required to attract efficient investment.

Another way to address the difficulties in making like-for-like comparisons, without undertaking a detailed study of all aspects of the regulatory arrangements is to check if there is any trend to change approaches or allowed parameters or to make adjustments in relation to recent developments.

This raises the issue of whether the Commission's approach of setting a margin above the mid-point can be evaluated in isolation from considering how the mid-point is arrived at. A related issue is the extent to which the global financial crisis has impacted on relevant risks and associated parameters adopted in regulatory decisions. In particular there is a debate about the extent to which the market risk premium and risk free rate are inversely related, particularly where there are significant changes in the risk free rate or there is a material and likely sustained increase in uncertainty. The adoption of long term averages for the risk free rate in the UK could be interpreted as accepting that there is an overall return on equity that is required (which would imply a strong inverse relationship between the risk free rate and the market risk premium) but that in times of low interest rates it is preferable to use a long term average rather than adjusting the market risk premium. However, in the case of New Zealand risk free rates are considerably higher than in the UK and the US so that there would appear to be less of a case to make such an adjustment.

There is, however, still the issue of whether the approach to setting a margin above the mid-point can be isolated from considering how the mid-point was arrived at. This depends on how well determined were the mid-point and the approach to selecting an estimate above the mid-point in the first place and whether circumstances have changed that impact on both aspects. If there was a strong expectation that the allowed overall WACC would not preclude

efficient investment from occurring and being sustained a wider review would not seem necessary. However, if a wider review of the cost of capital was to be undertaken then the authors of this report consider that it should be broadened to consider how all aspects of the regulatory arrangements affect relevant risks and compensation for those risks in the allowed WACC.

4.2 HOUSTONKEMP ECONOMISTS ON BEHALF OF POWERCO

HoustonKemp Economists (2014) agree with key qualifications made in the Economic Insights paper in relation to interpreting the comparisons but highlighted a number of examples where they considered the comparisons were misleading as follows (p.38):

- the analysis of the US Federal Energy Regulatory Commission (FERC) does not account for the fact that in developing its reasonable range FERC applies a number of filters namely:

  The use of observed bond yields to check the reasonableness of return on equity estimates is consistent with the practice by the Federal Energy Regulatory Commission (FERC) of the United States. FERC uses the average yield on public utility bonds over a six month period to ensure that any return on equity estimate is reasonable. Any return on equity estimate that is within 100 basis points of the bond yield is excluded from the Commission's analysis of the return on equity

  On this basis, even if the FERC does not apply an uplift from the midpoint parameters, those midpoints inherently incorporate an uplift element;

- the suggestion that the Finnish regulator made no uplift adjustment ignores the fact that the regulator capped inflation at 1%, effectively providing an uplift given that this was substantially below forecast inflation; and

- the review of IPART suggests that no uplift is provided unless the uncertainty index is above one standard deviation. However, this omits the fact that IPART calculates both a prevailing and long term WACC and chooses the mid-point of those two values. The impact is an uplift of around 60 basis points from the mid-point prevailing estimate.

HoustonKemp Economists also concluded that in order to make robust comparisons it would be necessary to assess the degree of risk the wider regulatory regime imposes on businesses and how this is reflected in the midpoint WACC estimation.

In relation to the point that removing observations that are considered too low would have an impact on the mid-point that was estimated, this is not necessarily the case where there are procedures to remove observations that are considered too high. In this respect it is noted that FERC has applied a procedure to remove high end outliers described as follows (FERC 2013a p.146):

> *"All parties agree that Commission precedent requires the exclusion of cost of equity*
>
> results in the proxy group where such cost of equity estimates fail "fundamental tests of reasonableness and economic logic. The Commission has repeatedly applied the same high end outlier test since 2004, holding that a company's results should be

excluded from the range of reasonableness if its cost of equity estimate (i.e., its DCF result) is at or above 17.7% and its growth rate is at or above 13.3%."

The Economic Insights (2014, June) paper noted a number of significant uplifts that could be applied by FERC relating to specific risks and investment incentives. In addition, section 3 of this report discussed a recent FERC decision that represents a significant change on the longstanding practice and which entails a significant uplift to the mid-point of a reasonable range for the cost of equity.

The inflation adjustment used to calculate the real risk-free rate for Finland was not a cap for the assumed rate of inflation but a fixed forecast, as distinct from the adjustment for inflation applied to the asset base which is based on actual realised inflation rates in each year. The assumed 1.0% inflation rate for calculating the real risk-free rate appears to have been adopted to provide greater certainty, and there is no indication in the decision document that it was intended to be below the best forecast of the average inflation rate over the regulatory period. However, if there was a material positive difference between allowed inflation and expected inflation this would amount to an uplift to a mid-point estimate.

The point about IPART using an average of a prevailing and a long term WACC applies if one considers that there is a need to adjust the IPART approach so that the estimate of an uplift relates to a prevailing estimate. This may be reasonable to ensure a like-for-like comparison but also highlights the need to consider all aspects of the regulatory arrangements to ensure comparability or use supplementary information to arrive at a preferred estimate. However, IPART's averaging method will not consistently produce an uplift to the WACC calculated on current market data.

4.3   FRONTIER ECONOMICS ON BEHALF OF TRANSPOWER

Frontier Economics (2014a) has raised a number of concerns about the Economic Insights (2014) report. Transpower (2014) has also referred to these concerns. The main conclusions made by Frontier Economics (2014a, pp. 1-2) relate to the use of the basis points uplift to the mid-point in preference to an approach based on comparing percentiles inferred from WACC ranges mentioned by different regulators. In particular, Frontier claims the basis point approach is misleading where the width of WACC ranges is very dissimilar across regulatory decisions.

Economic Insights (2014) presents two methods of comparing the WACC uplifts provided by different regulators, one using the basis point uplift to the mid-point and the other using the percentile calculated assuming that the WACC range has a uniform distribution. The former was the preferred method, while the latter was presented for comparability with previous studies, including Frontier (2014b). However, when Frontier (2014b), Castalia (2014) and Oxera (2014) present percentiles from other regulatory decisions, they are estimated based on assuming a uniform distribution, although such a distribution was not likely to have been specified in any of the reported regulatory decisions.

Table 1 of Frontier (2014b) presents WACC ranges and chosen values for 13 UK regulator decisions and presents percentiles which Frontier has calculated using the following formula.

(4.1)   Percentile = (point estimate – lower bound) / (upper bound – lower bound)

This means that Frontier (2014b) implicitly assumed the WACC range represented a uniform distribution bounded by the stated upper and lower values of the range, although according to Frontier (2014a) this method has "no basis in fact".

Oxera (2014 p. 21) also notes:

> Where other regulators have referred to percentiles, and in Table 3.2 below and the tables in the submissions to the Commission, this tends to refer to the position within a range, assuming that the range is a uniform distribution.

In contrast, Economic Insights' preferred method of measuring WACC uplift using basis points depends only on the regulator's central estimate of the WACC (the mid-point of the range) and its final decision, and does not depend on the end-points of the range given or on any assumptions about its statistical distribution. We do not agree with Frontier's claim that this method is not valid when the width of WACC ranges reported by regulators varies (Frontier 2014a, p.2).

If the distributions of the ranges were similar then the width of the range would contain relevant information about the reliability of estimates. However, the ranges specified by regulators are typically not based on formal statistical distributions and often reflect the application of judgemental ranges for a few parameters and specific estimates for others without considering associated probabilities. Where ranges are not reported that does not mean there is certainty about the preferred estimate as regulators typically refer to uncertainty or imprecision in the estimates. And one cannot reasonably assume, as Frontier (2014b) implicitly did, that there is 100% probability that the true WACC lies within the regulator's stated WACC range of reasonableness (or within a range calculated from the ranges given for individual WACC parameters). Furthermore, it is noted that the wider interval for the Commerce Commission reported by Oxera (2014, Figure 3.2, p. 22) is based on assuming a 95 per cent confidence interval whereas the confidence intervals for the other regulatory decisions have not been specified in those decisions. Thus the width of the range is not considered to be a sufficiently reliable indicator of the degree of uncertainty of the estimate such that comparisons can be made based on width.

These considerations support the use of a basis points uplift as the comparative measure. It is also worth reporting Oxera's conclusion on regulatory precedent (Oxera 2014, p. 24):

> "A review of international precedent is therefore generally supportive of the Commission's approach to assume a WACC above the midpoint. However, given the differences in the estimation methodologies and regulatory frameworks, and the fact that international regulators typically rely mainly on judgement and qualitative evidence in arriving at a point estimate, it cannot be directly translated into a recommendation for a percentile to be used for electricity networks in New Zealand."

Frontier Economics also notes that if the percentile approach is used then it does not matter whether estimates are present in real or nominal or before or after tax forms. This is true but the basis point approach is considered preferable when the distributional properties of ranges are not specified.

Frontier Economics also claims that it is misleading to characterise the point estimate published by Ofgem in February 2014 as belonging to the same determination as that which gave rise to its range. In response it is noted that Ofgem explained its decision within the context of its previously stated ranges as follows (Ogem 2014, p.4):

> "Bearing all these factors in mind leads use to reduce our central reference cost of equity by 0.3 per cent to 6.0 per cent. This is the bottom of the range for the cost of equity we set out in our Strategy decision".

4.4 SAPERE RESEARCH GROUP ON BEHALF OF VECTOR LIMITED

Sapere Research Group (2014) also maintain that the validity of the basis point comparison depends on the width of the ranges of the various decisions being comparable but (p. 15): "if the ranges of WACC are volatile and wider, percentile is more appropriate to use than simple basis points". However, as they note this depends on the extent to which the width of the estimated range represents the uncertainty over the WACC estimate.

This point was also made by Frontier and addressed in the foregoing sub-section. We consider that the width of the range is not a good indicator of the degree of uncertainty in the WACC estimate and that a basis point comparison is a more useful indicator in the circumstances. However, as noted there are difficulties in making the comparisons given different regulatory arrangements and the comparability of mid-point estimates given different regulatory arrangements.

Although Sapere recognises that regulators have various methods of arriving at decisions on returns, they also suggest that "WACC percentiles [are] selected by the regulator". Our review does not support this assertion, and in fact regulators in jurisdictions outside New Zealand rarely refer to WACC percentiles. Statements such as "AER … adopted a WACC estimate at the 71st percentile" and "Ofgem adopted the 100th percentile of its estimated WACC range" are apt to cause confusion, as these regulators did not adopt any probability distributions relating to their stated WACC ranges, or indicate the percentiles.

4.4 COVEC ON BEHALF OF BARNZ

Covec (2014) in its report on behalf of the supports the Economic Insights approach of making basis points comparisons rather than percentile comparisons (p.6):

> "Economic Insights has reviewed a large number of WACC decisions from Australia, the UK, the EU and the USA and compared them to previous decisions in New Zealand. In doing so, Economic Insights focused on the size of the WACC uplift as indicated by basis points rather than percentiles.

> The stated reason for this approach is that the Commerce Commission is explicit about assuming a normal distribution when working with ranges and percentiles for WACC and/or its components. Other regulators either assume a uniform distribution or are not specific about any probability distribution.

We consider that this is a reasonable approach. However its merit does not derive solely from the stated reason. Comparing uplifts through basis points is a valid method anyway.

Suppose the results of a basis point comparison differ from the results when percentiles are compared. That would tell us that there is variation in the underlying distributional assumptions, even if such variation could not be detected in the written decisions of regulators. In that context, the basis point comparison would obviously be preferred because it focuses directly on the increment to WACC.

In our view, the Economic Insights work is robust and their conclusions are appropriate."

4.5 CONCLUSION

The submissions in relation to the Economic Insights (2014) report have highlighted a number of valid issues in relation to making comparisons of regulatory decisions about the appropriate allowed rate of return for regulatory purposes. Some of these issues were discussed in the original report and others have been responded to in this report.

The broad conclusions of the June 2014 report are still considered to be reasonable. However, it is noted that it is important to use supplementary information on investment outcomes in determining an appropriate allowed rate of return.

ANNEX A: DETAILS OF REGULATORY WACC DECISIONS

Table 4: Details of Regulatory WACC Decisions in Various Jurisdictions

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
Australia					
Australian Energy Regulator (2013a)	Electricity and gas distribution and transmission	Revenue or price caps	There is considerable discretion to apply uplifts (see transitional decision below) but preferred parameters for market risk premium and equity beta are consistent with a preferred point estimate well above the mid-point of a reasonable range.	Up-lift to mid-point for market risk premium and equity beta, scope for higher estimates of other parameters or recognition of special factors.	CAPM is used as a 'foundation model' with cross checks. Trailing average cost of debt is proposed. A market risk premium of 6.5 per cent from a range of 5 to 7.5 per cent is preferred. But the preferred estimate can change depending largely on dividend growth estimates. An equity beta of 0.7 is preferred from a range of 0.4 to 0.7 based on international estimates and Black CAPM estimates. Use of trailing average cost of debt should imply no or little uplift for cost of debt component when data for efficient benchmark are finalised.
Australian Energy Regulator, (2014))	Electricity Distribution	Revenue cap with efficiency	8.04 (7.56-8.01), 2014-15, 100th, 24 basis points, assuming only cost of debt	Uplift to WACC to minimise future price variations, and take	Application of guidelines (see above). AER (2014, p. 38): "Comparing the upper bound of our range (8.1) to the point estimates

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
		incentives	range contributes to range. 8.04 (6.54-8.32), 2014-15, 84th, 61 basis points assuming market risk premium, equity beta and cost of debt range contributes to range. 7.80 (6.54-8.32), 2014-15, 71st, 37 basis points assuming market risk premium, equity beta and cost of debt range contributes to range and preferred cost of debt is at mid-point of range.	account of current market conditions.	applied by the NSW/ACT DNSPs to develop the transitional year revenue requirements (8.5 per cent and 8.9 per cent) suggests the NSW/ACT DNSPs have overstated the rate of return by approximately 40 basis points and 80 basis points respectively. Note that, for the reported range in AER (2014), the market risk premium was a point estimate of 6.5 from a range of 5 to 7.5 per cent specified in the Guideline. Equity beta was 0.7 from a range of 0.4-0.7 specified in the Guideline. Return on debt was the higher of two estimates (Bloomberg BBB fair value and Reserve Bank of Australia estimate).
Economic Regulation Authority (Western Australia) (2013a)	Gas transmission and distribution	Price cap	6.43 (5.75-6.85), 2014 indicative result, 51st percentile, 13 basis points	The uplift reflects the combination of a market risk premium of 6 from a range of 5-7.5 and a beta of 0.7 from a range of 0.5-0.7.	CAPM is primary model with cross checks from other approaches. In the guidelines, ranges are estimated for market risk premium and equity beta. Choices for specific decisions reflect assessment of range of relevant estimates and view that estimates of beta below one have a downward bias

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
					and consideration of specific factors for regulated entity. The debt risk premium is a trailing average updated annually.
Economic Regulation Authority (Western Australia) (2013 b, c)	Urban Rail Network	Revenue cap	5.56 point estimate 2013-14	There is no reported range in the decision paper but the issues paper setting out the methodology reported an equity beta range of 0.38 to 0.46. However, point estimate of market risk premium is below the mid-point of the range identified in the rate of return guidelines for gas pipelines and there was cross reference to this work.	CAPM is primary model with cross checks from other approaches. The cost of debt was calculated from the standard 'on the day' approach.

This decision only applies for one year. Further decisions will make reference to the gas transmission and distribution guidelines, finalised in December 2013 (see preceding decision). |
| Economic Regulation Authority (Western Australia) (2013 b, c) | Freight Rail Network | Revenue cap | 7.89 point estimate, 2013-14 | There is no reported range in the decision paper and no range for the equity beta (1.0) or the market risk premium in the issues paper setting out the methodology. | See above. |

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
				See above re point estimate of market risk premium.	
Economic Regulation Authority (Western Australia) (2013 b, c)	Iron Ore Freight Rail Network	Revenue cap	10.06 point estimate, 2013-14	There is no reported range in the decision paper and no range for the equity beta (1.43) or the market risk premium in the issues paper setting out the methodology. See above re point estimate of market risk premium.	See above.
Essential Services Commission (Victoria) (2013)	Urban water distribution, treatment and retailing	Price cap	7.09 (6.07-7.71), 2013-, 62nd percentile, 20.5 basis points	Point estimates within ranges for equity beta and market risk premium were based on previous decision which was based on conservative estimates (see next decision below).	CAPM is primary model.
Essential Services Commission (Victoria) (2008)	Gas distribution	Price cap	9.15 (8.23-9.71), 2008-2012, 62nd percentile, 18 basis points	Conservative estimates of preferred debt premium, equity risk premium and beta chose for preferred	CAPM is primary model

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
				estimate.	
Independent Pricing and Regulatory Tribunal (NSW), (2014, 2013)	Third party access to rail network	Revenue cap	9.0, (8.4-9.7), 2014-19, 50th, 0 basis points	None based on estimate of uncertainty index which is within 1 standard deviation from long term average of zero.	IPART (2013) has revised its approach to determining the WACC. The methodology set out in the base approach sets a feasible WACC range and then chooses a point estimate from the WACC range using a decision rule based on an 'economic uncertainty' index based on financial measures of volatility and dispersion of returns. If the uncertainty index is within 1 standard deviation from the long term average of 0 the mid-point WACC is selected, otherwise there is discretion to choose a different estimate.
Queensland Competition Authority (2014a, b, 2011)	Urban water distribution, treatment and retailing	Price monitoring	9.35, 2010-13, point estimate.	None	CAPM is used and cross checked with other methods for market risk premium. The WACC estimate draws on the analysis in Appendix B of QCA (2011). The market risk premium is 6.0 per cent and the equity beta is 0.66 with gearing of 0.6.

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
					A major review of the cost of capital methodology is under way and position papers in relation to the coal rail network and urban water businesses are expected to be made available in 2014. The most recent decision on the market risk premium has raised the preferred estimate from 6.0 to 6.5 per cent based on a wider range of evidence including the impact of recent conditions. However, point estimates are still being adopted in decisions.
Europe					
Denmark (NordReg 2011).	Electricity Distribution	Revenue cap with incentives to reduce grid losses.	7.5, 2008.	None	WACC is not used. Return is capped at 30 year mortgage bond plus 1%. The 30 year mortgage bond was 6.5% in 2008. One year regulatory period.
Finland Energy Market Authority (2011).	Electricity Distribution and transmission	Revenue cap and rate of return cap, operating cost	Point estimate (undisclosed), 2012-2015	None disclosed	CAPM is used with 0.5% uplift for liquidity constraint, 5% market risk premium, 30% gearing

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
		incentives up to 3% of WACC			
France – French Energy Regulation Commission (2012)	Natural gas transmission	Price control with investment and productivity incentives	6.5, 2013-2016, point estimate based on undisclosed range	None disclosed	CAPM is used. 3 percentage point premium over ten years for certain network integration projects (previously applied for main network expansion). Provision for recovery of stranded assets. Gas transmission considered low risk and asset beta lowered to 0.58
France – French Energy Regulation Commission – Deliberation (Final), 26 February 2009	Electricity transmission and distribution grids	Price control with productivity incentives	7.25, 2009-2012 point estimate based on undisclosed range	None disclosed	CAPM is used. Gas & electric transmission 7.25% from 2000 to 2009 (Cambini and Rondi 2009).
Netherlands Authority for Consumers and Markets (2006)	Electricity transmission grid	Revenue cap with productivity incentives	6.7 (6.0-7.4), 2007-2010, 50th percentile, 0 basis points.	Mid-point of bandwidth (6-7.4) is used but with (undisclosed) conservative estimates of the parameters.	WACC is set in real terms. Estimate of 6.7 assumes inflation of 1.25%. CAPM is used.
Portugal National Communications Authority (2013)	Various telecommunications services	Price control	11.69, 2013, 50th (point estimate), 0 basis points.	None	CAPM is used. MRP is average of Damodaran DDM and Fernandez survey results. WACC is updated

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
					annually.
Swedish Energy Markets Inspectorate (2011)	Electricity transmission	Revenue cap	Average of mid-point of two ranges (2012-2015)	None	CAPM is used. But insufficient information to calculate nominal vanilla WACC. The average of the mid-points of two ranges (proposed by consultants) is adjusted for some tax effect benefits and a liquidity premium. This leads to an adjustment from an average of 5.5 per cent for a real before tax WACC to 5.2 per cent as the preferred estimate.
United Kingdom					
Competition Commission (2014)	Electricity transmission and distribution	Price cap regulation with efficiency incentives	7.48 (6.66-7.48), 2012-2017, 100th percentile, 41 basis points.[18]	Adopted upper end of the range, noting that inflation estimate of 3.25% (based on Office of Budget Responsibility estimates) may be interpreted as at the upper end and a lower forecast would increase the	CAPM is the main model used for cost of equity. NIE argued for a premium to standard CAPM to reflect higher risk but Competition Commission did not approve such a premium. CC allowed the cost of embedded

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[18] Based on inflation estimate of 3.25 per cent preferred by Competition Commission based on Office of Budget Responsibility forecasts (Competition Commission 2014, p. 13-5).

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
				real cost of debt, the evidence as a whole and credit metrics and consumer impact modelling.	debt based on NIE's actual debt, with appropriate consideration of whether it had been incurred prudently and efficiently through examination of the yield on NIE's bond and comparable bonds issued by GB electricity distribution companies. This included an apparent premium for NIE debt compared with benchmarks. Adopted a range for the real risk free rate of 1-1.5 per cent. Noted the upper end of the range is well above the long term (1900-2012) real interest rates on Treasury bills of 1.1 per cent and that long dated index yields were currently 0 per cent and remained below 1 per cent for at least the last 5 years (paras, 13.120, 13.125, 13.129). Range for real cost of equity for market as a whole was 5-6.5 per cent. This produces a range for the market risk premium of 4-5 per cent. Various ex ante and ex post methods were used. The upper limit of 6.5 per cent

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
					was lowered from the estimate of 7 per cent used in recent regulatory decisions.
					Asset beta range was 0.35 to 0.4.
					Range for real vanilla WACC was 3.3-4.1 per cent.
					Reported estimate is comparable to recent Ofgem decisions but lower than CC reports from 2007 to 2010.
Competition Commission (2007)	Airports (Heathrow)	Price cap for airport charges	8.48 (7.41-8.62), 2008-2013, 88th percentile, 46 basis points	Uplift to real pre tax WACC, implying uplift to return on equity (converted to nominal vanilla WACC here)	Competition Commission (2007, p. 4) "In recognition of the inherent uncertainties in any such estimates, and of the importance of not allowing a rate of return that is insufficient to generate necessary new investment that would be of significant benefit to airlines and passengers, we have adopted figures for the real, pre-tax cost of capital close to the top end of our range."
Competition Commission (2007)	Airports (Gatwick)	Price cap for airport charges	8.70 (7.51-8.90), 2008-2013, 85th percentile, 49 basis points	See above	See above

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
Ofcom (2014 a, b, c)	Telecommunications access prices for copper network	Price cap with incentive mechanisms	7.17[19] (6.7-7.17), 2016/17 to 2018/19, 100th percentile, 23.5 basis points. Point estimates were reported for all the parameters except the market risk premium which was used to construct the range.	Preferred estimate of market risk premium is at upper end of range, based mainly on historical evidence and consistent with the recent Competition Commission 2014 NIE Final Determination.	CAPM used and forward looking cost of debt based on BT bond data. Ofcom calculated the cost of capital for BT as a whole and then 'split' the WACC into WACC for the copper network and the rest of BT. This entailed disaggregating the component parameters of the WACC. Real risk free rate of 1.3 per cent and inflation assumption of 3.2 per cent applied to both components of BT. Estimate of debt premium for Openreach was 1 per cent at the low end of a range of 1 to 1.5 per cent for BT as a whole. The preferred equity risk premium of 5 per cent was at the high end of a reported range, consistent with the estimate preferred by the Competition Commission (2014). The beta estimate for Openreach was a point estimate based on an assessment that it would lie below the

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[19] Nominal vanilla WACC assuming inflation of 3.25%.

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
					mid-point of a lower bound of an average beta for network utilities (including electricity and water) and the beta for BT as a whole (Ofcom 2014, p. 214).
Ofgem (2014)	Electricity Distribution	Price cap regulation with efficiency incentives	7.17 (7.17–7.61), 2015-2023, 1st percentile[20], -22 basis points	Estimate is described as central reference point but represents lowest point of the range for the cost of equity specified in the Ofgem (2013) Straegy Decision.	CAPM and cash flow risk analysis are used. Estimate of beta is conservative. Trailing average cost of debt is used. Incentive arrangements can mean higher or lower rates of return are realised.
Ofgem (2012)	Electricity transmission	Price cap regulation with efficiency incentives	7.95 (7.53-8.03), 2013-2021, 83rd percentile[21], 16.5 basis points	The estimate is described as a central reference point but represents an estimate in the upper half of the range implied by a range	CAPM and cash flow risk analysis are used. Estimate of beta is conservative. Trailing average cost of debt is used. Incentive arrangements can mean

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[20] This is based on a range of 6-7.2 for the real after tax cost of equity, a gearing ratio of 65 per cent, a real cost of debt of 2.62 (as specified or implied in Ofgem (2014) and expected inflation of 3.25 per cent (preferred by Competition Commission 2014). The estimates would change each year in accordance with the use of a trailing average cost of debt.

[21] This is based on a range of 6-7.2 for the real after tax cost of equity, a gearing ratio of 60 per cent, a real cost of debt of 2.92 (as specified or implied in Ofgem (2012) and expected inflation of 3.25 per cent (preferred by Competition Commission 2014). The estimates would change each year in accordance with the use of a trailing average cost of debt.

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
				for the cost of equity.	higher or lower rates of return are realised.
Ofgem (2012)	Gas transmission	Price cap regulation with efficiency incentives	7.78 (7.46-7.92), 2013-2021, 67th percentile[22] , 7.7 basis points	As above.	As above.
Ofwat (2009)	Water and sewerage services	Price caps of water and sewerage with incentive mechanism	8.52 (6.24-9.03), 2010-15, 81st, 87.8 basis points	Ofwat used unmarked up range but estimate from higher end based on the range of evidence considered.	CAPM used, with cross checks from other approaches and mix of embedded and forward looking cost of debt. Small companies were allowed higher returns of 8.7 (two) and 8.9 (others). Europe Economics recommended that the underlying WACC be marked up by 14 per cent for the asymmetry of consequences and selected a real post tax point estimate of 4.3 from a range of 2.9 to 5.4.

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[22] This is based on a range of 6-7.2 for the real after tax cost of equity, a gearing ratio of 62.5 per cent, a real cost of debt of 2.92 (as specified or implied in Ofgem (2012) and expected inflation of 3.25 per cent (preferred by Competition Commission 2014). The estimates would change each year in accordance with the use of a trailing average cost of debt.

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
United States					
FCC (2013)	Local exchange carriers	5% of total regulated revenues are still regulated by rate of return, rest are regulated with a price cap	11.25, 1990 to date, 75th percentile	(uplift to WACC not available in electronic records)	CAPM and DCF are used. FCC (2013) staff report recommends 75th percentile of a WACC range from 7.39 to 8.72, based on recent and more relevant variables but changing the longstanding benchmark is still to be considered by FCC commissioners. The rationale for using the upper half of the range was based on an assessment of liquidity or credit worthiness (measured by times earnings covered interest obligations ratios) and recognising the historically low interest rates and infrequency of re-prescription.
FCC (2014)	Telecommunications – Universal Service Fund	Support for price cap regulated carriers to maintain universal voice service	8.5 (6.48 - 9.20) (2014-reset) 74.3[th] percentile, 66 basis points	uplift to WACC mid point applying FCC Staff Report (2013) methodology. Note that the mid-point of the upper half of a full range of reasonableness was preferred as it would	CAPM and DCF are used. FCC (2013) staff report sets out methodology which has been applied to data from price cap carriers. See above.

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
		and expand broadband		effectively be locked in for five years and the data used to calculate the zone of reasonableness reflects a time of historic lows (FCC 2014, para 107).	
FERC, (2013a, b, 2011) and United States Court of Appeals (2013)	Electricity transmission	Return on equity with investment incentives	Median for individual or mean for group application, 2011 – update	Uplifts to nominal cost of equity for investment incentives and specific risks of up to 2.5%.	DCF is used.

Recent policy paper signals a more focussed and rigorous framework for investment incentive approvals. |
| FERC, (2013a, b, 2011) and United States Court of Appeals (2013) | Gas pipelines | Return on equity with investment incentives | Median | None | DCF is used. |
| FERC, (2014) | Electricity transmission | Return on equity with investment incentives | 7.79 (6.02-8.37) 2014 - update, 75th percentile, 60 basis points | Mid point of upper half or range of reasonableness for return on equity based on need to ensure appropriate investment given anomalous capital market conditions. | A range for the return on equity was specified as 7.03 to 11.74 with a preferred estimate of 10.57. There was no decision on cost of debt, but embedded cost of debt is typically used and assumed here at 5 per cent with 50 per cent gearing for the purposes of comparison. |

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
California Public Utilities Commission (2012)	Electricity and Gas distribution, San Diego Gas & Electric (SDG&E)	Rate of return	7.79 (7.42-7.84), 2013-2015, 88th percentile, 16 basis points	Return on equity was chosen at "the upper end" of the range as "reasonably sufficient to assure confidence in the financial soundness of the utility and maintain investment grade credit ratings while balancing the interests between shareholders and ratepayers."	The range is indicative and reflects best estimates derived by different methods (CAPM, RPM, DCF) rather than a confidence interval.
California Public Utilities Commission (2012)	Electricity distribution, Southern California Edison Company (SCE)	Rate of return	7.90 (7.58-7.97), 2013-2015, 82nd percentile, 12.5 basis points.	Return on equity chosen at "the upper end" of the range (same reason given as with SDG&E above).	As above
California Public Utilities Commission (2012)	Gas distribution, Southern California Gas Company (SoCalGas)	Rate of return	8.02 (7.66-8.13), 2013-2015, 77th percentile, 12.5 basis points	Return on equity chosen in the "upper middle range", noting "that gas utilities are less risky than electric utilities" (also with same reason given as with SDG&E above).	As above

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
California Public Utilities Commission (2012)	Electricity and Gas distribution, Pacific Gas & Electric Co. (PG& E)	Rate of return	8.06 (7.75-8.16) 2013-2015, 76th percentile, 10.5 basis points.	Return on equity chosen at "the upper end" of the range (same reason given as with SDG&E above).	As above
Commonwealth of Virginia State Corporation Commission (2013)	Electricity utility	Rate of return	Return on equity 10.0%	No reasonableness range disclosed.	Capital structure 50% common equity\n\nCost of debt not provided.
District of Columbia Public Service Commission (2012).	Electricity distribution	Rate of return	8.03 (7.9-8.15), 2012-reset, 52nd, 0.5 basis points.\n\n.	"It has been the Commission's practice to use the midpoint of the range of reasonableness as the ROE." (p.61)	DCF method preferred but attention given also to an analytical study of ROEs in >500 past regulatory decisions. Reasonable range loosely based on ranges offered by the parties. Preferred estimate based on the midpoint of the range for the return on equity less a 50 basis point adjustment for the Bill Stabilization Adjustment (BSA) mechanism which stabilises revenues and reduces risk. Embedded cost of debt used. Range shown in this table has been adjusted down by 50 basis points.
Georgia Public Service Commission	Electricity	Rate of return, earning	Return on equity decision: 10.25%. Midpoint of the		Embedded cost of debt, capital structure and cost of capital not

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
(2010)	utility	sharing mechanism, approved stipulation	"reasonableness dead band" 9.75% to 10.75%.		stated.
Illinois Commerce Commission (2013)	Electricity delivery services	Rate of return with collars	6.904, point estimate	None	Statutory requirement that the return on equity be the average 30-year U.S. Treasury bond yield plus 580 basis points.
Indiana Utility Regulator (2013)	Electricity Utility	Rate of return	6.97 (6.77-7.10), 2013-reset 70th percentile, 8.5 basis points		Higher than the mid-point of the range of reasonableness estimated by the regulator but represents the mid-point of ranges from the parties to the decision.
Florida Public Service Commission (2013)	Integrated electricity utility	Rate of return with earnings sharing, stipulation (negotiated settlement).	8.39 (7.79-8.98), 2013-16, 50.5th percentile, 0.5 basis points	Not disclosed.	The end points of the range define points at which the utility or other parties can seek another rate case. Mid-point of return on equity preferred but this does not automatically correspond to mid-point of WACC.

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
Massachusetts Department of Public Utilities (2009)	Electricity distribution	Rate of return with revenue decoupling mechanisms to stabilize revenue and align utility incentives to promote energy efficiency.	7.86 (7.71-8.152), 2010 – reset, 34th percentile, -7.0 basis points	No explicit formulation. There was an unspecified adjustment for less risk associated with decoupling (less than the 25 basis points deduction to the return on equity proposed by the AG).	Parties used several models, Department considered all evidence with more focus (with reservations) on the Gordon DCF model. Reasonable range not provided, but noted between estimates of 10.02% and 11.02% for the return on equity produced by the Attorney General (AG) and the company using two groups of proxy companies & the Gordon DCF model.
North Carolina Utilities Commission (2013)	Integrated electricity utility	Stipulation subject to approval	7.88 (7.64-8.17), 2012-reset, 45th percentile, -2.5 basis points %. .	Midpoint of return on equity preferred.	Public Staff witness developed the recommended 10.2% return on equity from a range of 9.75% to 10.75% using the comparable earnings approach. Embedded cost of debt used. The Commission noted the approved ROE was (p.11)"as low as reasonably possible. They appropriately balance Duke Energy Carolinas' need to obtain equity financing and maintain a strong credit rating with its customers' need to pay the lowest

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
					possible rates."
Public Service Commission of Maryland (2013)	Electricity distribution	Rate of return	7.63 (7.13-8.12)[23] 2013-reset, 50.5th, 0.5 basis points Return on equity: 9.36%.[24] .	Midpoint of return on equity preferred (includes 8 basis points flotation adjustment).	The four parties used a number of methodologies (DCF, CAPM and several others) and PSC found (p.105): "all of these analytical tools helpful and will not rely on any one to the exclusion of the others". … "Considering all of the methodologies presented, we will accept Staff's recommended ROE of 9.36% as just and reasonable."[25] Staff expert derived estimates of 10.36% based on DCF and 8.34% based on ECAPM The Commission did not want to deviate substantially from the 9.31% ROE it had determined in July 2012, being unhappy that Pepco had filed for a new rate case just 5 months after that,

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[23] Castalia Strategic Advisors (April 2014) refers to a reasonable ROE range of 9.1% to 10.25%. These refer to the People's Counsel proposed ROE of 9.1% ROE (in the absence of a Grid Resiliency Charge) and Pepco's requested 10.25%. In this table we have confined attention to reasonable ranges concluded by the regulatory commission, or in some instances by its staff.

[24] Castalia Strategic Advisors (April 2014) refers to a reasonable ROE range of 9.1% to 10.25%. These refer to the People's Counsel proposed ROE of 9.1% ROE (in the absence of a Grid Resiliency Charge) and Pepco's requested 10.25%. In this table we have confined attention to reasonable ranges concluded by the regulatory commission, or in some instances by its staff.

[25] Ibid, p.105.

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
					without any justification in terms of substantial changes to the business environment.
Public Utilities Commission of Ohio (PUCO) (2013)	Electricity Distribution	Rate of return, Endorsed stipulation	7.72, 2013-reset	Method of calculating ROE not disclosed.	ROE agreed through negotiation. Not to be used as a precedent in future rate hearings.[26]
Pennsylvania Public Utility Commission (2012).	Electricity Distribution	Return on capital with efficiency incentives	7.99 (7.34–8.48), 2013-reset, 64th percentile, 14 basis points	Uplift to WACC for management effectiveness incentive and to help fund network improvements	DCF is primary model with cross checks from other models. Embedded cost of debt used. Range includes 0.12 percentage points uplift to return on equity for management effectiveness incentive. Decision also referred for need to fund $1.6 billion of improvements.
State of New York Public Service Commission (2014)	Electricity, gas and steam, Consolidated Edison Company of New York	Rate of return with earnings sharing mechanism. Approved negotiation	7.10 for electric & 7.15 for gas and steam, in first year (2014). Increases slightly in following two years. No WACC range available. .	Uplift to nominal vanilla WACC (calculated using 8.8% return on equity) is 19 to 24 basis points respectively.	The return on equity was agreed through negotiation but "consistent with results that would be obtained using cost of equity methodologies ... commonly employed." p. 48 "Staff had … concluded that a base ROE of 8.8% would be appropriate, and that the 9.2% and 9.3% figures proposed represent the

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[26] This is a conventional proviso for stipulations

Country/ Regulator decision	Regulated sector	Type of regulation	WACC (range), years of application, percentile, basis point uplift	Nature of adjustment	Special factors/notes
					ROE based on Staff's methodology plus a traditional amount of financial and business risk premium typical of multi-year rate plans."
State of New York Public Service Commission, Order Adopting Recommended Decision With Modifications (2009)	Electricity & gas delivery service, Central Hudson Gas & Electric Corporation	Rate of return	7.28%	No range of reasonableness provided.	

All WACCs are in nominal vanilla terms (combining a post company tax return on equity and a pre tax return on debt with tax effects allowed for in the cash flows)

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