INTERNATIONAL COMPARISON OF UTILITIES' REGULATED POST TAX RATES OF RETURN IN: NORTH AMERICA, THE UK, AND AUSTRALIA

A Report Prepared by NERA

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1. EXECUTIVE SUMMARY

The Australian Competition and Consumer Commission (ACCC) commissioned NERA to survey declared post tax regulatory rates of return across various jurisdictions in the United Kingdom and North America.

The data collected for this survey concentrates on the calculation of the real vanilla post tax WACC, which is defined as:

$$WACC = R_e \frac{E}{V} + R_d \frac{D}{V}$$

Where:

Re is the declared / regulatory real cost of equity;
Rd is the real declared / regulatory cost of debt;
D / V and E / V are gearing ratios.

The vanilla post tax WACC abstracts from the treatment of all aspects of tax (including imputation credits and the interest deductibility of debt). The results of this survey are summarised in the following two tables.

Table 1.0
Vanilla post-tax WACC's across jurisdictions

UK Regulators	Vanilla Post Tax WACC	US Regulators	Vanilla Post Tax WACC	Australian Regulators	Vanilla Post Tax WACC
Ofwat 1999	4.3-5.6%*	**FERC 1995**	8.11%	**ACCC (MAP)**	6.37%
CC 2000	6.45%	**The California Public Utilities Commission 1998**	5.93% & 6.52%	**ACCC (CWP)**	7.64%
Offer 1997	5.04-6.48%			**ACCC (Transgrid)**	6.86%
Ofgem 2000	4.77-5.17%	**The Massachusetts Department of Public Utilities 1995**	7.09% & 6.61%	**IPART (AGLGN)**	6.36%
Ofgem 2000	4.57-5.33%			**ORG (El. DBs)**	6.8%
MMC 1997	5.46-7.31%	**National Energy Board 1999**	5.43%		
Ofgas/MMC 1997	5.06-6.51%				

*+small company premium + embedded debt premium

Table 1.1
Average real post tax rates of return across jurisdictions

	North America	United Kingdom*	Australia
Return on equity	8.8%	6.9%	10.1%
Return on debt	4.8%	4.4%	4.6%
Vanilla WACC	6.6%	5.6%	6.8%

* Where a range has been given then the midpoint of that range has been used to calculate the average.

As can be seen from Tables 1.0 and 1.1, Australian regulators are, if anything, declaring higher vanilla post tax WACCs than in other jurisdictions examined. Purely based on the declared returns examined in this survey, Australian regulators appear to offer approximately the same or higher returns than North American regulators who in turn appear to offer significantly higher rates of return than in the United Kingdom.

Declared post tax rates of return are generally the best available proxies for the incentive to invest in regulated businesses. As such, it would appear that a strong case can be made from the statistics in this survey for the view that Australian energy regulators are providing incentives to invest that are at least commensurate with those offered in North America and the United Kingdom.

Nonetheless, it should be noted that incentives to invest are driven by *expected* rather than *declared* post tax rates of return and these can diverge for a number of reasons. For example, the declared post tax rates of return in the UK may underestimate the expected post tax rates of return due to potentially "generous" allowances for tax costs in that jurisdiction. Other aspects of any regulatory regime, such as the application of price caps that do not allow businesses to pass on increases in wholesale energy costs, can also cause expected returns to fall below declared returns. This has been the case for some electricity retailers in California recently. However, there is no strong reason to believe that accounting for such factors would change the rankings derived from declared rates of return discussed above.

2. INTRODUCTION

The Australian Competition and Consumer Commission commissioned NERA to survey allowed post tax regulatory rates of return for gas and electricity transmission and distribution businesses in North America and the United Kingdom. The ACCC also asked that NERA provide commentary where possible on the impact of these regulatory decisions on the incentive for efficient investment in the carriage of gas and electricity in that jurisdiction.

The remainder of this paper is structured as follows. Section 2 briefly outlines the underlying tensions that exist when attempting to interpret and compare post tax regulated returns across jurisdictions. In particular, the importance of each jurisdiction's methodology for converting post tax to pre tax rates of return is examined and explained.

Section 3 describes the approaches taken to determining post and pre tax rates of return in each of the regulatory decisions included in this report. In the UK, the MMC, Offer and Ofgas (and now Ofgem) have all adopted a real, pre-tax rate of return, based on the same simplified conversion formula. By contrast, Ofwat and North American regulators estimate the cost of capital on a post-tax basis, and allow separately for the cost of tax, either as an addition to the allowed rate of return, or as an element of the cashflows used to determine the revenue requirement.

Section 4 provides the data on allowed rates of return and provides a brief commentary on this data.

Appendix B sets out the various definitions of post tax WACCs.

3. METHODOLOGICAL ISSUES

This report compares the rates of return declared in regulatory decisions across a range of jurisdictions. In particular, we report on the following declared rates of return (and related variables):

i. $R^D e$ – the declared real unit post tax cost of equity. (Including the value of the risk free rate, equity premium, and equity beta - if a CAPM methodology is used to derive this value.)

ii. $R^D d$ – the declared real unit cost of debt; and

iii. $(D/V)^D$ - gearing ratios (benchmarked if appropriate).

The D superscript is used to denote the "declared" level of a variable applied by the regulator.

These values are also combined to provide an estimate of the implicit declared "vanilla" real post tax weighted average cost of capital.

Vanilla real post tax WACC = $WACC = R_e \frac{E}{V} + R_d \frac{D}{V}$.

There are several definitions of the "post tax WACC" each with its own implicit or corresponding definition of the "cost of tax".[1] The vanilla post tax WACC is the return to capital after both corporate tax and any imputation credits (see below) have been accounted for elsewhere in a business's cash flows. For this reason the vanilla post tax WACC is appropriate for cross-jurisdictional measures, as it is unaffected by differences in statutory tax rates and the existence of tax imputation systems. However, it is still important to examine the treatment of tax in each jurisdiction in order to understand its potential impact on investment incentives. Further discussion of the various definitions of "the" post tax WACC is provided in Appendix B.

3.1. Declared versus expected rates of return

It is important to make a distinction between the rate of return declared by the regulator in its calculation of allowable revenues/prices and the expected rate of return on a new investment perceived by the regulated business. By definition, the incentive to invest in regulated assets is determined by the *expected* real post tax return on equity used to finance

[1] For example the Officer post tax WACC is commonly applied in Australia. This effectively attempts to allow for the value of imputation credits and deductibility of interest within the WACC rather than in the business's regulated cash flows.

that investment.[2] This concept is distinct from the real post tax return on equity declared by the regulator.

While the declared real post tax return on equity and the (implicit) declared vanilla post tax WACC are important influences on the expected post tax return on equity, there may not always be a "one to one" relationship between them. This can be seen using an example where the regulatory regime employs a cost of service methodology to build up real regulated revenues and there is zero risk that those real revenues will be achieved. In such circumstances, the expected (equal to actual) revenue from an investment can be given as:

$$\text{Expected revenue} = R^D e * E^D + R^D d * D + \text{Tax}^D + \text{Depreciation}^D + O\&M^D \quad (1)$$

$$= (\text{Vanilla WACC}^D) * (E+D) + \text{Tax}^D + \text{Depreciation}^D + O\&M^D \quad (2)$$

Similarly, the expected non-equity costs of financing and maintaining the investment can be summarised as:

$$\text{Expected non equity costs} = R^A d * D^A + \text{Tax}^A + \text{Depreciation}^A + O\&M^A \quad (3)$$

The A superscript denotes actual expected annual costs.

The expected post tax return on equity from the investment is simply the difference between (1) and (3) divided by the level of equity financing used. In other words:

$$\text{Expected return on equity} = ((1) - (3)) / (\text{Equity financing of investment}) \quad (4)$$

The declared regulatory rate of return on equity is just one variable on the right hand side of this equation. It can be seen that the expected return on equity will only equal the declared regulatory return on equity if each of the regulatory terms in equation (1) matches their actual counterparts in equation (3)[3]. Clearly, all other things equal, the expected post tax return on equity will be greater than the declared regulatory return on capital if:

i. the declared regulatory allowance for company tax[4] is greater than the expected actual cost of tax;

ii. the declared regulatory cost of debt is greater than the expected actual cost of debt;

iii. the regulatory gearing level is lower than the actual gearing level[5]; and

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[2] Assuming that management operates in accordance with the best interest of equity holders.

[3] Or, if they do not exactly match then they are offset by each other. For example, if the regulatory unit cost of debt is higher than the actual cost of debt then it may be expected that this is because the actual level of debt financing is lower than that hypothecated by the regulator. Consistent with the Modigliani-Miller theorem these two effects would exactly offset each other in a perfect capital market assuming that the regulator had correctly matched the hypothecated level of gearing to the hypothecated unit cost of equity and debt.

[4] Throughout this report the term "tax" will be used to represent "company tax".

iv. the level of regulatory O&M costs associated with the investment are greater than the expected actual O&M costs.

Furthermore, the above analysis has been carried out assuming that real regulated revenues are known with certainty. Where these are subject to risk then the expected rate of return on equity will depend on the business's perceptions of those risks. For example, a business's expected revenue from an investment (and therefore its expected post tax return on equity) may be less than that set out in equation 1 if it:

v. is subject to price cap regulation and the business considers that volume predictions used in setting post investment prices are too high. It is worth noting that this risk may be higher in North America, where prices in gas transmission are derived on the basis of capacity rather than forecast volumes, compared to Australia and the UK; [6].

vi. considers that the risk of "regulatory stranding" or writing down of the regulated value of the investment is greater than zero;

vii. considers that the allowance for inflation is lower than actual expected inflation - it is also worth noting that this risk is more relevant to North American nominal regulatory regimes than in Australian and UK inflation adjusted regimes;

viii. considers that financial modelling by the regulator is "adjusted" to take account of other "factors" such that the declared rates of return are not effective.

From the above analysis, it is clear that when attempting to examine the expected real post tax return on equity (and hence the incentive to invest) it is important to examine both the declared real post tax regulatory rate of return on equity and the impact of all of the factors 1 through 8 above. However, such a task is beyond the scope of this report which focuses on the potential impact of the rate of return decision alone. Nonetheless, it is important to note and understand that the expected post tax return on equity (and hence incentive to invest) can vary from the declared regulatory return for all of the above reasons.

3.2. Divergence between regulatory and actual tax costs and the incentive to invest

If taxable profits[7] and regulatory profits (return on equity) are identical then the net cost of tax can be calculated by using a simple equation that "scales up" the target post tax

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[5] And there is no compensating increase in the cost of debt (either in financing the investment in question or in refinancing other debts).

[6] For further information see "Regulation of Tariffs for Gas Transportation in a Case of 'Competing' Pipelines: Evaluation of Five Scenarios" a report prepared for the ACCC in October 2000. This can be found at www.accc.gov.au/gas/fs-gas.htm.

[7] Assessable income under the company tax regime.

regulatory profit to give the matching target pre tax regulatory profit. This "scaling up" formula is set out in equation (5) below.

$$\text{Real pre tax return on equity} = (\text{Real post tax return on equity}) / (1-T^*(1-\gamma)) \quad (5)$$

Where:

T is the statutory tax rate: and

γ is the value of imputation credits[8].

This equation follows from the fact that a dollar increase in return on equity imposes a net cost of $T^*(1-\gamma)$ dollars tax – assuming regulatory and taxable profits are identical.

However, regulatory profits and taxable profits are generally not identical and are often significantly different. In such situations, the above "scaling up" formula will tend to over/under compensate the regulated business for the true cost of tax. As a result, the expected real post tax rate of return on equity will tend to be higher/lower than the declared real target post tax rate of return[9]. Similarly, the incentive to invest will be higher/lower than may appear to be the case from simply examining the declared rate of return.

In such situations, the cost of tax can be accurately accounted for if the actual tax liabilities of the company are modelled in the same fashion that other costs, such as operating and maintenance costs, are modelled. [10]

Taxable profits are likely to differ from the regulatory profits (return on equity) for a number of reasons – in particular the existence of inflation and accelerated tax depreciation. In general, the "scaling up" approach is likely to overestimate the true cost of tax, although

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[8] In determining the allowed revenue for a utility business, regulators generally aim to set revenue at a level that allows the business to earn a reasonable post-tax real rate of return on the capital invested, whilst also covering its operating costs and financing its net tax obligations. However, under an imputation tax system not all company tax is a cost to the individual equity holders as some or all of tax paid is effectively rebated via the distribution of imputation credits with dividends. The net cost of tax is the difference between company tax paid and the value to equity holders of any imputation credits earned by virtue of that payment. If the value of imputation credits can be represented by "γ", then, when "γ" equals one, every dollar of tax paid at the company level is valued as a dollar less tax paid at the personal tax level (in this situation the net cost of company tax is zero). When "γ" equals zero the net cost of company tax is the total amount of company tax paid. In other words, an additional dollar of taxable income at the company level imposes a tax cost of $T^*(1-\gamma)$ (where T is the statutory tax rate).

[9] For example, the regulator may declare a real post tax return on equity of 6 percent. However, if the regulatory allowance for tax is higher than the actual cost of tax then the perceived/expected real post tax return on equity could be, say, 7 percent.

[10] Alternatively, the statutory tax rate in the "scaling up" factor may be replaced by a long run "effective" tax rate which is itself modelled to take into account likely long term divergences between the income tax base and the regulatory return on equity. With perfect knowledge and foresight these two approaches could well be equivalent with different effective tax rates applying to different businesses. However, in reality the latter "long run effective tax rate" approach would be likely to be an approximation to the full modelling of taxable income.

this conclusion may not hold in times of high inflation.[11] The following two sections (3.2.1 and 3.2.2.) briefly describe the mechanics of this with further detail included in Attachment A.

3.2.1. Impact of inflation on the taxable income base

Company tax regimes around the world are invariably based on current income and depreciation of the historical value of assets. Under regulatory arrangements where revenues are indexed to the CPI, rising price levels cause real taxable income and regulatory return on equity to diverge in two, potentially offsetting, ways. Essentially, inflation drives a wedge between:

i depreciation allowed for regulatory purposes and depreciation allowed for taxation purposes. Inflation has the effect of reducing the real value of tax depreciation below the real value of regulatory depreciation, to the potential detriment of the regulated business; and

ii nominal interest rates (which are fully deductible for tax purposes) and real interest rates (which is the cost of debt used in determining regulatory profits). Inflation has the effect of reducing the real post tax cost of debt to businesses below the real deemed regulatory cost to the potential benefit of the regulated business.

The level of inflation will determine to what extent these two effects are material.

Neither of these effects applies in a regulatory framework based on nominal returns on an historic cost asset base.

These issues are discussed more fully in Appendix A.

3.2.2. Impact of accelerated tax depreciation on the taxable income base

Even in a zero inflationary environment, regulatory depreciation may differ from tax depreciation, due to, for example, accelerated depreciation allowances for new capital investment.

Under an accelerated depreciation scheme, companies are allowed to depreciate new assets faster than under the regulatory regime, either as a result of shorter assumed asset lives, or a steeper depreciation profile than the standard straight-line profile typically adopted by regulators. In this situation, taxable income will tend to be lower than regulatory income in the early life of assets (when tax depreciation is accelerated relative to actual depreciation) and higher in the later years (when tax depreciation is lower than regulatory depreciation). Thus, accelerated depreciation effectively provides an interest free loan from the tax

[11] Assuming a statutory tax rate and the correct value of imputation credits has been applied.

authorities – where the principle on the loan at any time is the difference between the tax written down value of the asset and the regulatory written down value of the asset multiplied by the statutory tax rate. The loan is finally paid back when the tax written down value of the asset is equal to the regulatory written down value.

In isolation, accelerated tax depreciation will cause real taxable income, and therefore tax liabilities, to be lower than those implicitly assumed in the "scaling up" approach. This in turn will mean that the *expected* real post tax return on equity will tend to be higher than the declared real post tax regulatory return on equity.

The regulatory treatment of accelerated tax depreciation and its impact on the measured returns to equity at any point in time is an issue in both nominal and CPI-linked regulatory regimes.

It is common practice in North American jurisdictions to deal with accelerated depreciation by effectively reducing the capital base of the regulated business by the quantum of deferred taxes under accelerated depreciation. This recognises that a portion of the capital base has (effectively) been financed by an interest free loan from the tax authorities. An alternative, but equivalent method, which has also been applied in some North American regulatory jurisdictions, is to measure the amount of tax forecast to be paid in each period and include this directly in operating costs. This approach has been referred to by the ACCC as the post-tax approach

A similar approach to that taken in North American jurisdictions has been applied in Australia by the ACCC in transitioning some businesses from a simple scaling up approach to a direct inclusion of actual tax costs in allowances for operating costs. This approach is taken because a change in regulatory practice from a simple "scaling up" approach to a modelling of actual tax liabilities may create transitional windfalls in the presence of accelerated tax depreciation. Under a simple "scaling up" approach accelerated tax depreciation means that a business tends to be over compensated for actual tax liabilities in the early years and under compensated in the later years of asset's lives. The only net benefit to the business from this is a timing benefit. However, if the regulator moves to include actual tax liabilities in operating costs while the asset's written down tax value is less than its written down regulatory value then the business will receive a permanent benefit (equal to this difference multiplied by the statutory tax rate). This is because, from that point on there will be no future under compensation for tax to offset over compensation that has already occurred.

The ACCC has proposed to deal with this transitional difference by subtracting from the businesses' asset base the quantum of deferred taxes at the time of transition to a regime where actual tax costs are included in allowable operating costs. This is necessary to make the approach fully consistent with that used in North America. Under the ACCC approach firms are provided with the benchmark post-tax return on funds employed in addition to full compensation for forecast tax liabilities. Under the North American approach the tax liabilities are compensated for by reducing the interest free loan from the government

accumulated by previous over-compensation for actual tax liabilities. One advantage of the ACCC approach is that there is no problem linked with ensuring the interest free loan build-up is adequate to compensate for future taxes since the tax estimates and regulatory accounts are fully reconciled within each regulatory period and long term forecasts of tax liabilities are not required.

There is also an argument that any such transitional adjustment should be examined in the context of other impacts (such as the impact of inflation on real taxable income) that may have worked in the opposite direction to the deferred tax (see 3.2.1 above).

3.3. Decisions examined in this report and their approach to tax

From the previous analysis it is clear that a comparison of the declared post tax return on equity across jurisdictions should be done hand-in-hand with a comparison of the treatment of tax costs in each jurisdiction. To the extent that a simple "scaling up" approach is used it is likely that there will be a divergence between declared (regulatory) and expected returns from an investment. Hence, it is likely that the declared returns do not fully reflect the true incentive to invest.

Table 3.3.1 lists the different decisions examined in this report and their approach to estimating the cost of tax. All North American regulators estimate the actual cost of tax based on forecasts of the regulated business's taxable income. This is reflected in the fact that all North American decisions examined have a "tick" in the modelling of tax column. On the other hand, all but one of the UK industry regulators examined used a simple "scaling up" approach to estimate tax costs based on the statutory tax rate. All but one of the Australian decisions examined use a modelling of tax liabilities approach. [12]

[12] Although this is a relatively recent change in Australian regulatory practice.

Table 3.3.1
Regulatory decisions examined and the approach to tax

Regulator	Business	Activity	Year	Simple "scaling up" (using statutory tax rate)	Modelling of Tax
UK					
Ofwat	Various	Water and sewerage distr.	1999	✗	✓
Com. Comm.	Various	"	2000	✗	✓
Offer	Nat. Grid Company	Electricity transmission	1997	✓	✗
Ofgem	Nat. Grid Company	Electricity transmission	2001	✓	✗
Ofgem	Public Electricity Suppliers	Electricity distribution	2000	✓	✗
MMC	Northern Ireland Electricity	Electricity distr. and transmission	1997	✓	✗
Ofgas / MMC	British Gas	Gas transmission and distribution	1996/97	✓	✗
North America					
FERC	Transcontinental Gas Pipeline Corporation	Gas transmission		✗	✓
The California Public Utilities Commission	San Diego Gas and Electric Company	Electricity distr.		✗	✓
	''			✗	✓
National Energy Board	Maritimes and N.E. Pipelines Managt. Ltd	Gas transmission		✗	✓
The Massachusetts Department of Public Utilities	Massachusetts Electric Company	Electricity distr.		✗	✓
"	Boston Gas Company	Gas distribution		✗	✓
Australia					
ACCC	Transgrid	Elec. Trans.		✗	✓
ACCC	Moomba-Adel. Pipeline	Gas Transm.		✗	✓
ACCC	Central West Pipeline	Gas Transm.		✗	✓
ORG	Victorian Electricity Distributors	Elec Distr.		✗	✓
IPART	AGLGN	Gas Distr.		✓	✗

It is important that the information contained in the above table is kept in mind when interpreting the data on declared regulatory rates of return in the following section. It is quite possible that those decisions which have a tick in the "scaling up" approach column involve an overestimate of the true cost of tax if the regulated business has high levels of

acceleration of tax depreciation on existing assets and/or high levels of actual gearing.[13] It should be noted that until recently both the Australian and UK tax law incorporated high levels of tax depreciation.[14]

In particular, it is important to note that those regulatory decisions where tax costs have been estimated by simply "scaling up" post tax targeted returns on equity, also tend to have the lowest declared regulatory rate of returns. To the extent that the simple "scaling up" approach tends to overestimate the actual tax liabilities of the business then this means that the expected real post tax rate of return on equity may well be higher than the declared rate by the regulator. It is quite likely that this is the case in the presence of accelerated tax depreciation (on existing assets) and high levels of actual gearing used by the companies.

Estimating to what extent, if any, this results in over compensation for tax would require detailed modelling of taxable income of each business and is beyond the scope of this report. Nonetheless, the general approach to "scaling up" the real post tax return on equity taken in each decision can throw some light on the potential "generosity" of such an approach. The approach to "scaling up" in the relevant UK and Australian decisions is discussed below.

3.3.1. Formula applied where "scaling up" approach has been used to estimate tax costs

3.3.1.1. The UK

In contrast to Australia, the UK operated a partial imputation system for the taxation of companies and their shareholders. The tax on company profits is paid in two instalments. Advance Corporation Tax (ACT) on dividends is payable at the time of distribution. This tax is then deducted from the total corporation tax bill due nine months after the end of the company's accounting period. As a result, if a company has zero retained earnings then the maximum rate of tax on taxable profits is equal to:

$$t_c - t_s*(1-t_c)/(1-t_s)$$

where:

t_s = the rate of ACT

t_c = corporation tax rate

This rather complicated formula can be understood intuitively in that, although all ACT taxes paid on dividends can be used to reduce corporate tax, only $(1-t_c)/(1-t_s)$ of profits can be paid out as dividends while still leaving sufficient funds to pay corporate tax.

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[13] High levels of gearing reduce real taxable income below real regulatory profits in the presence of inflation by increasing the level of nominal interest payments (which are tax deductible). This is in contrast to real regulatory profits (return on equity) where only real interest costs are deductible.

[14] Prior to the November 1996 UK Budget, the capital allowance for plant and machinery (ie, the rate at which assets could be depreciated for tax purposes) was 25%. This was reduced in the 1996 Budget to 6%.

The formula used to derive the post tax cost of equity in all UK decisions[15] examined in this report, except for water, is calculated as simply 1/(1-Maxm. rate of tax). This gives the following simple "scaling up" equation.

Pre-tax cost of equity = post-tax cost of equity * $(1-t_s)/(1-t_c)$

Application of the MMC formula based on the tax rates prevailing in the three 1997 UK decisions resulted in a tax adjustment of 1.194 percent. This was calculated using the then current rates of 33% for corporation tax and 20% for ACT.

In the July 1997 budget, changes to the UK tax system were announced. In particular, the rate of corporation tax was reduced, and it was announced that the ACT credit for tax exempt or corporate shareholders was to be abolished from 1 April 1999, while the credit to individual shareholders was to be reduced to 10%.[16] In the two UK electricity decisions in the year 2000 the tax adjustment factor used was 1.429 percent, based on a forward looking corporate tax rate of 30% and ACT credit rate of 0%. By setting t_s to 0%, it has been implicitly assumed that it is pension funds and other corporate shareholders who are the marginal investors. No account is taken of the continuing 10% ACT credit received by individual shareholders. However, the MMC have noted that:

> "It is open to question whether the ACT offset against mainstream corporation tax should have been removed in full. However, as the changes are relatively recent and share price patterns have been relatively volatile it is not possible to resolve this question definitely at this stage. For the purposes of the present inquiry we must assume no offset against the main rate of tax".[17]

The essential point to note about the UK is that none of the regulators who employed a "scaling up" approach made any allowance for the impact of accelerated depreciation or inflation on the real value of actual tax liabilities. In addition, those regulators have taken a conservative (potentially "generous" to the business) approach to the valuation of imputation credits in the most recent year 2000 decisions.

3.3.1.2. Australia

The only Australian decision examined that uses a simple "scaling up" approach is the IPART year 2000 AGLGN decision. In this decision the statutory tax rate of 30 percent was used to scale up post tax real to pre tax real revenues. In doing so, a range for the value of imputation credits (γ) is provided of between 30 to 50 percent. This gives a pre tax return on equity of:

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15 The MMC also applied the same tax adjustment in its price review of Scottish Hydro Electric (1995), British Airports Authorities (1996), Manchester Airport (1997) and Cellnet and Vodafone (1998).

16 July 1997 budget.

17 MMC report on Vodaphone/ Cellnet, (1998) page 66.

Pre tax return on equity = (Post tax return on equity) / (1-0.3*(1-γ))

Once again, this approach makes no allowance for the impact of inflation and accelerated depreciation on actual tax liabilities. Similarly, and in the light of recent changes to Australian tax law[18], it is an open question as to whether the treatment of γ is conservative or not (see section 4.1 below).

3.3.1.3. North America

All North American regulatory estimates of the cost of tax take into account the impact of inflation and accelerated depreciation on actual tax liabilities. North American regulatory bodies determine the allowed rate of return in nominal terms which, in turn, is applied to the (depreciated) actual historic cost incurred by the builder of the asset (ie, a DAC asset base using historical, as opposed to current, asset values). As discussed in section 3.2.1, this means that inflation will not drive a wedge between nominal taxable profits and nominal regulatory profits.

As a result, directly estimating actual tax liabilities in the US is simpler than in CPI-X regimes since it generally only requires estimates of the impact of accelerated tax depreciation on taxable income.

[18] Australian residents are now able to claim a full tax rebate up to the value of imputation credits even if their personal tax rate is lower than the company tax rate.

4. RESULTS: DATA AND INTERPRETATION

4.1. Results

The following tables provide data for comparison on the declared regulatory rates of return in the UK, North America and Australia.

Table 4.1
UK Regulators' and Comp. Commission's Declared Positions on Real Post Tax Cost of Capital

	Ofwat 1999	**CC 2000**	**Offer 1997**	**Ofgem 2000**	**Ofgem 2000**	**MMC 1997**	**Ofgas 1997**
Company Activity	Water Sector	Water Sector	National Grid Company	National Grid Company	Electricity Distribution	Northern Ireland Electricity	British Gas
Tax rate	Company specific	Company specific	33%	31%	31%	33%	33%
Tax adjustment	-	-	1.194	1.492	1.429	1.19	1.194
Equity beta	0.7 – 0.8	0.95	0.55 – 0.75	1.0	1.0	0.6 – 0.75	0.55 – 0.73
Risk free rate*	2.5% - 3.0%	3.0%	3.5% - 3.8%	2.5% - 2.75%	2.25% - 2.75%	3.5% - 3.9%	3.5% - 3.8%
Debt premium	1.5% - 2.0%	1.9%	0.4%	1.7%	1.4%	0.3% - 0.8%	0.3% - 0.5%
Gearing	Around 50%	50%	24%	60% - 70%	50%	8%	20.8%
Equity risk premium	3.0% - 4.0%	4.0%	3.5% - 4.5%	3.5%	3.25% - 3.75%	3.5% - 5.0%	3.5% - 4.5%
Asset beta		0.5		0.3 – 0.4			
Real post tax return on equity	4.6 – 6.2%	6.8%	5.4 – 7.2%	6.0 - 6.3%	7.9 – 9.3%	5.6 – 7.7%	5.4 – 7.1%
Vanilla Post-tax WACC	**4.3-5.6% ****	**5.8%**	**5.0 - 6.5%**	**4.8 - 5.2%**	**5.0 – 5.5%*****	**5.5-7.3%**	**5.1-6.5%**

*A range of methods were used to estimate the risk free rate. This included both historical and forward-looking returns on index linked and ordinary gilt bonds.
* *plus a small company premium + embedded debt premium.
***Ofgem included a 0.4% adjustment for long-term debt.

Table 4.2
North American Regulators' Declared Positions on Real Post Tax Cost of Capital

	FERC	The California Public Utilities Commission		The Massachusetts Department of Public Utilities		National Energy Board (Canada)
	1995	1998		1995		1999
Activity	Gas Trans.	G&E Dist.	G&E Tran.	Gas Distr.	Elec Distr.	Gas Trans
Tax rate	Company specific	Company specific	Company specific	Company specific	Company specific	Company specific
Real cost of debt	5.88%	4.2%	4.35%	5.58%	4.87%	4.01%
Gearing	42.42%	51.0%	50.25%	46.24%	49.66%	75%
Nominal cost of equity	12.5%	10.6%	11.6%	11.0%	11.0%	13.0%
Real cost of equity	9.74%	7.73%	8.71%	8.39%	8.33%	9.71%
Vanilla Post tax WACC	**8.11%**	**5.93%**	**6.52%**	**7.09%**	**6.61%**	**5.43%**

The data in Table 4.2 is of a different form to that reported in Table 4.1 above and Table 4.3 below. This reflects the fact that North American regulatory regimes do not arrive at declared cost of equity and cost of debt figures using a CAPM approach. As such, there is no reporting of risk free rates, market premiums and equity/asset betas. Instead, North American regulators tend to estimate the required return on equity directly from such methods as "dividend growth models". Similarly, North American regulators do not hypothecate debt gearing and debt costs per company. Instead, regulators allow the recovery of actual forecast debt costs in the same way as tax and operating and maintenance costs.

It is also important to note that US regulation operates in nominal terms. As such, the above real figures have been calculated by adjusting nominal figures for the actual annual rate of inflation in the US since the date of the decision. Nominal regulation means that regulated businesses and their investors bear the risk of higher than expected inflation. Over the relevant periods examined it is possible that anticipated inflation at the time the nominal returns or equity were determined has been higher than actual inflation. As such, it may be reasonable to assume that expected real rates of return on investments in North America at the time each decision was made were actually lower than implied by the above table.

Table 4.3
Australian Regulators' Declared Positions on Real Post Tax Cost of Capital

	ACCC (MAP-Draft)	ACCC (CWP)	ACCC (Transgrid)	IPART (AGLGN)	ORG (El. DBs)
Year	2000	2000	1999	2000	2000
Activity	Gas Trans.	Gas Trans.	Elec. Trans.	Gas Distr.	Elec Distr.
Tax rate	Company specific	Company specific	Company specific	30%	Company specific
Gamma	0.5	0.5	0.5	0.5	0.5
Gearing %	60	60	60	60	60
Risk free rate	2.97	3.44	3.55	3.52	3.5
Equity risk premium	6.0	6.0	6.0	5.0-6.0	6.0
Asset beta	0.5	0.6	0.35-0.5	0.4-0.5	0.4
Equity beta	1.16	1.5	0.8-1.2	0.9-1.1	1.0
Debt beta	0.06	0.00	0.00-0.06	0.06	0
Debt premium	1.2	1.2	1.0	0.9-1.1	1.5
Real cost of debt	4.1	4.6	4.5	4.6	5.0
Real post tax return on equity*	9.7	12.2	10.4	8.9	9.5
Vanilla Post-tax WACC*	**6.4**	**7.6**	**6.9**	**6.4**	**6.8**

* Where a final number has been stated by the regulator (within a range) this has been reported here. For example, the AGLGN cost of equity, debt and WACC are all calculated back from reported real pre tax return on equity of 7.75% and a nominal post tax return on equity of 12%. Where a range still exists for the publicly available information, the mid point of that range has been used reported.

The results in each of the above three tables are summarised in Table 4.4 below.

Table 4.4
Average real post tax rates of return in the energy sector across jurisdictions

	North America	United Kingdom*	Australia
Return on equity	8.8%	6.9%	10.1%
Return on debt	4.8%	4.4%	4.6%
Vanilla WACC	6.6%	5.6%	6.8%

* Where a range has been given then the midpoint of that range has been used to calculate the average.

There are at least three broad differences that can be seen when comparing the above Australian data with that from North America and the UK.

i. The average declared real vanilla post tax weighted average cost of capital in the Australian decisions examined is considerably higher than the average of the UK and is broadly similar to the North American decisions examined. The average for Australia is 6.8 percent compared to 6.6 percent in North America and an average midpoint of 5.6 percent in the UK.

ii. A significant proportion of the difference between Australian and UK WACCs is accounted for by the difference between the equity premiums applied. The average range in the UK decisions is 3.45-4.25 percent compared to 5.8-6.0 percent in Australia.

iii. Consistent with this is a relatively high real post tax cost of equity declared in Australian decisions (10.1 percent in Australia compared with 8.7 percent in North America and a midpoint of 6.2 percent in the UK).

4.2. Interpretation of data

To the extent that all other factors are equal then the higher declared rates of return in Australia would tend to imply that the incentive to invest in the regulated Australian energy sector is, if anything, greater than or approximately similar to the incentives in the UK and North America respectively. Furthermore, it would appear from the magnitudes involved that taking accent of factors other than the declared real rates of return would be unlikely to alter this ranking.

Nonetheless, it would be necessary to attempt to account for all such factors in order to make definitive statements about the relative incentives to invest in different jurisdictions. Section 3.1 outlined eight reasons why the post tax real rate of return declared by the regulator may differ from the rate expected by the regulated business. As expected rates are the critical factor for incentives to invest, all eight of these factors should ideally be examined before drawing definitive conclusions about incentives to invest[19]. We have examined only one of these factors in detail, in particular whether the allowance for tax is greater or less than the actual cost of tax associated with a new investment. (Nonetheless, a cursory examination of some other factors[20] would suggest that these may tend to increase the relative attractiveness of investing in Australia and the UK compared to North America.)

The analysis of the allowance for tax made in each jurisdiction tends to "muddy the waters" when comparing declared rates of return in the UK with those in Australia and North America. Section 3.3.1.1 suggests that the electricity decisions in the UK could potentially

[19] In addition, even in an integrated capital market, different international tax treaties and the taxation of repatriated profits may well mean that different countries must offer different real returns on equity in order to attract investment funds.

[20] Specifically, the bearing of inflation risk and the risks associated with price cap regulation based on capacity rather than forecast volumes.

have involved an overestimate of the cost of tax. As such, it is possible that declared rates of return in the UK are less than the actual rates perceived by the regulated businesses. This means that the gap between UK and Australian/North American declared post tax rates of return may not be as great as first appears to be the case. However, it would seem unlikely that accounting for this factor alone would offset the 1.0/1.2 percentage point difference between average UK and North American/Australian declared post tax vanilla WACCs examined in this study.

It is also possible that the impact of inflation in a regulatory environment based on nominal returns may mean that reported rates of return in North America overstate the incentives to invest there. North American declared real rates of return have been calculated by deflating[21] nominal declared rates of return by the actual inflation rate since the relevant decision. Three of the decisions examined were in 1995 and the actual inflation rate in the US over the five years leading up to 1995 was 3.4 percent compared to 2.4 percent since then. To the extent that this drop in inflation was not expected by investors then it is possible that the expected real rate of post tax return on equity in North American jurisdictions was lower than that reported by us in Table 4.2 above. To the extent this were the case then it would tend to support an interpretation to the effect that Australian regulators have provided relatively generous levels of real post tax return on equity.

Another factor that makes it difficult to compare these declared real rates of return is that it is not always clear what number (within a declared range) has been used by the regulator. For instance, Ofwat publish a "text book" post tax WACC[22] but actually use a vanilla post tax WACC in their financial modelling. Furthermore, "adjustments" are made where projected financial ratios breach "covenant" levels as happened in with a number of companies at Ofwat's last review.

In terms of the application of asset betas, it is not possible to make a direct comparison between Australian/UK regulators and North American regulators given that North American regulators do not report their decisions within a CAPM framework. However, explicitly reported asset beta's in the UK and those implicit (given assumed regulatory gearing ratios) would appear to be around or less than 0.5. This is consistent with the Australian average of 0.48.

It is also interesting to note the differences in declared equity premiums used by regulators in the UK and Australia. Australia's relatively high level of equity premium can be used to explain most of the difference in declared real post tax rates of return on equity in the UK and Australia. There may be a range of reasons for a relatively high equity premium in Australia compared to the UK. However, one possible reason is that, until recently international capital markets were not well integrated and that the Australian equity market

[21] Applying the Fisher equation.

[22] See appendix A for description.

was therefore relatively more risky due to its smaller size and so the greater difficulties of diversification.

Integration of international capital markets raises two issues in relation to the interpretation of declared rates of return in Australia. First, has international integration reduced the forward looking Australian equity premium below long-term historical survey averages? Second, has international integration reduced the value of imputation credits to the marginal investor (as that investor is now more likely to be a foreign resident and unable to benefit from imputation credits)?

It is outside the scope of this report to attempt to provide definitive answers to these questions. However, it is useful to note that consistency would generally require that a lower regulatory valuation of imputation credits (based on a view of increased capital market integration) should also be associated with a lower regulated equity premium to the extent that capital market integration has reduced the forward looking Australian equity premiums. Against this, however, recent changes to the ability of Australian investors to access imputation credits are likely to have enhanced their value to domestic residents. If this was used to justify a higher gamma in regulatory decisions then it is arguable that consistency requires that purely domestic data be used to determine the regulatory equity premium.

5. SUMMARY

In summary, while definitive statements in this area are problematic, there is little evidence from the decisions surveyed in this report that Australian regulators are offering lower investment incentives than in North America and the UK. In fact, there are reasons to suggest that Australian regulatory decisions may be relatively more generous than is implied through a simple comparison of declared rates of return across jurisdictions.

This is especially true of comparisons with North American decisions where investors in regulated utilities bear inflation risk and where price caps may be based on deemed capacity rather than forecast volumes. In terms of comparisons with the UK, some of the difference in declared post tax rates of return may be "cancelled out" by a relatively generous estimation of company tax liabilities in the UK. However, it seems unlikely that this would fully "cancel out" the 1.2 percentage point average difference in post tax WACC between Australia and the UK found in this survey.

APPENDIX A: INFLATION AND REAL TAX LIABILITIES

Inflation and the depreciation wedge

Under a real, CPI-linked regulatory regime, the presence of inflation results in a disparity between the depreciation allowed for regulatory purposes and the depreciation allowed for tax purposes, *even where there may be no difference between the time profile of depreciation allowed for regulatory and for tax purposes* (even where there is no accelerated tax depreciation).

For taxation purposes, the capital base is always considered in historical cost terms, rather than in current cost terms. Depreciation is therefore also calculated on the basis of historic cost. An increase in the rate of inflation does not therefore affect the nominal level of tax depreciation.

In a real, CPI-linked regulatory environment, however, the asset base is denominated in current cost terms and, as a consequence, regulatory depreciation is also denominated in current cost terms. An increase in inflation therefore increases the nominal level of regulatory depreciation in line with the increase in the CPI.

All other things constant, the effect of this is that taxable income rises faster than inflation and hence rises faster than regulatory return on equity. As a result, tax liabilities also rise faster than inflation and rise faster than implicitly assumed by the simple "scaling up" factor. In isolation, this effect means that, in a CPI linked regime, real taxable income will be higher than the targeted real regulatory return on equity. This in turn will mean that the *expected* real post tax return on equity will tend to be lower than the declared real post tax return on equity.

In a nominal regime, the regulatory asset base is determined in historical cost terms, and is not linked to the CPI. The asset base used for regulatory purposes and taxation purposes is therefore identical, and the actual amount of both regulatory depreciation and tax depreciation will be unaffected by a rise in the general price level. The "wedge" problem discussed above therefore does not arise.

Inflation and deductibility of nominal interest payments

The second way in which inflation causes taxable profits to depart from profits is through the tax advantage for debt funding.

Under a real, CPI-linked regulatory regime, allowed returns are determined in real terms, and the 'inflation compensation' component of an investor's return is delivered through indexed adjustments to the revenue stream. Implicit in the use of the simple "scaling up" approach is the assumption that only the real cost of debt is tax deductible. However,

taxation law is almost universally based on nominal values and, as such, it is the nominal cost of interest that is deductible for tax purposes.

In isolation, this effect means that, in a CPI linked regime, taxable profits will tend to be lower than regulatory profits – if the later is estimated using the simple "scaling up" of regulatory profits. As a result, actual tax liabilities will be lower than estimated and therefore the *expected* real post tax return on equity will tend to be higher than the declared real post tax regulatory return on equity.

While this effect serves to offset the impact of inflation discussed above, the relative magnitudes of these effects will depend on the gearing assumption used by the regulator, the actual level of gearing, the level of depreciation and on rate of inflation.

In a regulatory regime that operates in nominal terms, this complication does not arise because the WACC formulation offers an unbiased estimate of the tax advantage of debt.

APPENDIX B: THE VARIOUS DEFINITIONS OF THE "POST TAX WACC"

The following table sets out the three most common forms of post tax WACC, and the definitions of cash flows and regulatory revenues that correspond with each EACC form.

WACC Version	WACC Formula	Corresponding Cash Flow	Corresponding Regulatory Target Revenue	Calculation of Tax and Franking	Comments
"Officer" Post-Tax WACC[23]	$WACC = \frac{(1-T)}{(1-T(1-\gamma))} R_e \frac{E}{V} + (1-T) R_d \frac{D}{V}$	*Net Cash Flow* = Revenue - O&M - Capex - Tax	*Target Revenue* = WACC x Capital Base + Depreciation + O&M + Tax	*Tax* = T x (Revenue - O&M - Tax Depreciation)	The use of the statutory tax rate for T in the equity term assumes that tax and economic depreciation are identical. If the effective tax rate is less than the statutory rate, then the estimate of WACC will be biased downwards (as the value attributed to franking credits would be overvalued). The use of the statutory tax rate for T in the debt term assumes that the company is in a tax paying position. If the company is not paying company tax, the estimate of WACC will be biased downwards (as the value of the interest deduction will be overvalued).
"Text Book" Post-Tax WACC	$WACC = R_e \frac{E}{V} + (1-T) R_d \frac{D}{V}$	*Net Cash Flow* = Revenue - O&M - Capex - Tax + Franking Benefit	*Target Revenue* = WACC x Capital Base + Depreciation + O&M + Tax - Franking Benefit	*Tax* = T x (Revenue - O&M - Tax Depreciation) *Franking Benefit* = γ x Tax - γ x T x Interest	As franking credits are included in the cash flows and target revenues, no assumptions about effective tax rates need to be made. The use of the statutory tax rate for T in the debt term assumes that the company is in a tax paying position. If the company is not paying any company tax, the estimate of WACC will be biased downwards (as the value of the interest deduction will be overvalued).

[23] Officer (1994), The Cost of Capital of a company under an imputation tax system, Journal of Accounting and Finance, 34.

WACC Version	WACC Formula	Corresponding Cash Flows	Corresponding Target Revenue	Calculation of Tax and Franking	Comments
"Vanilla" Post-Tax WACC	$WACC = R_e \frac{E}{V} + R_d \frac{D}{V}$	*Net Cash Flow* = Revenue - O&M - Capex - Tax + Franking Benefit	*Target Revenue* = WACC x Capital Base + Depreciation + O&M + Tax - Franking Benefit	*Tax* = T x Revenue - O&M - Tax Depreciation - Interest *Franking Benefit* = γ x Tax	As franking credits are included in the cash flows, no assumptions about effective tax rates need to be made. As the tax benefit of interest deductibility is taken into account when calculating the tax liability, no assumptions need to be made about the tax status of the entity.