ICRC

independent competition and regulatory commission

Water and Wastewater Discussion Paper 2

Return on Capital

Report 3 of 2007
March 2007

The Independent Competition and Regulatory Commission (the Commission) was established by the *Independent Competition and Regulatory Commission Act 1997* to determine prices for regulated industries, advise government about industry matters, advise on access to infrastructure and determine access disputes. The Commission also has responsibilities under the Act for determining competitive neutrality complaints and providing advice about other government-regulated activities. Under the *Utilities Act 2000* the Commission also has responsibility for licensing utility services and ensuring compliance with licence conditions.

The Commission has one part-time Senior Commissioner, Paul Baxter.

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For further information on this investigation or any other matters of concern to the Commission please contact the Commission on 6205 0799.

Foreword

The Independent Competition and Regulatory Commission (the Commission) is responsible for determining the tariffs that ACTEW Corporation (ACTEW) applies for the provision of water and wastewater services in the Australian Capital Territory (ACT). In order to determine these charges, the Commission undertakes a comprehensive inquiry into ACTEW's water and wastewater business on a regular basis, typically once every four or five years. Each inquiry results in the determination of a price path to apply for the length of the subsequent review period. The most recent review determined a price path to apply for the four years from 1 July 2004 to 30 June 2008.

It should be noted that the tariffs for water and wastewater set by the Commission recover the prudent and efficient costs of ACTEW providing those services. They do not include a recovery of the scarcity value of water nor do they include costs incurred by the ACT Government to manage water conservation in the territory. The ACT Government has introduced a Water Abstraction Charge that goes towards the recovery of these costs. In addition, the ACT Government has announced a tax to apply to utilities in the ACT. These are costs that may also be included in the final price that consumers pay for water and wastewater services. The Commission, however, is not responsible for determining these charges and taxes.

In preparation for the next price inquiry, which will determine water and wastewater tariffs to be charged by ACTEW and to apply in the ACT from 1 July 2008, the Commission is releasing a series of discussion papers. These papers, and any comments made in response, will form the basis of the regulatory approach to be adopted by the Commission in conducting the inquiry. This discussion paper is the second of a series of three discussion papers the Commission intends to release between late 2006 and early 2007

The Commission delayed the release of the second and third discussion papers, pending the receipt of a reference directing it to conduct the review of water and wastewater pricing from the ACT Government. This reference has been received by the Commission and is included as an appendix to this paper.

The first discussion paper provided a discussion of the technical regulatory issues the Commission must consider in determining a regulatory price path. This discussion paper outlines the issues surrounding the determination of the return on capital. In determining the return on capital, the Commission aims to grant a rate of return on capital that gives the regulated business incentive to make efficient investment decisions. In the Commission's 2004 price determination, the return on capital accounted for approximately 45% of ACTEW's total efficient costs as determined using the building-block method.

The building-block method, which includes the return on capital, was covered in depth in the first discussion paper. The Commission decided to release a separate discussion paper on the return on capital, because of its importance within the building-block costs and the complexity of determining the value to apply. Measuring the return on capital requires specialised understanding of finance theory.

As outlined in the foreword to the first discussion paper, the importance of water management has been brought to public attention in recent years as a result of the drought which has affected the ACT and much of south-eastern Australia. The Australian Government and state and territory governments have identified water management as a significant issue. The task of the Commission

in completing the 2007–08 price review and approving water and wastewater tariffs for the following years, while having regard to government policies and relevant social, economic and environmental considerations, is an important step in any national water management strategy.

As always, the Commission believes that community involvement is crucial to the regulatory process. The Commission is seeking submissions from the ACT community on matters relating to water and wastewater pricing and the level of service that consumers expect to receive for the price they pay.

Based on this discussion paper series, and any submissions made in response to the discussion papers, the Commission will release a working conclusions paper in July 2007. As the initial step in the formal price inquiry process, the paper will detail the Commission's approach to the price determination. The Commission expects to release a draft decision by October 2007 and a final decision by March 2008. The Commission will seek comments from interested parties, and intends to hold a public hearing, between the releases of the draft and final reports.

Event	**Date**
Release of information paper	August 2006
Release of discussion paper 1	November 2006
Release of discussion paper 2	March 2007
Release of discussion paper 3	April 2007
Close of submissions on discussion papers	15 June 2007
Release of working conclusions paper	July2007
Close of submissions on working conclusions paper	September 2007
Release of draft report	October 2007
Close of submissions on draft decision	December 2007
Public hearing	December 2007
Release of final report and price direction	March 2008

Paul Baxter
Senior Commissioner
March 2007

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1 Introduction

The traditional motivation of price regulation is ensuring that a provider of essential services with a natural monopoly does not take advantage of its market power and earn monopoly profits. To achieve this goal, regulators set prices on a cost recovery basis—that is, the regulator allows the business to earn revenue roughly equivalent to the efficient costs of operating the business.

Another motivation that has attracted interest in regulatory circles in Australia is providing the business with the correct incentives to make efficient investment to ensure the long-term provision of the regulated service at levels of service commensurate with the expectations of the regulated business's customers. This has been captured in paragraph 5d of the terms of reference of the water and wastewater pricing review, which directs the Commission to have regard to:

> an appropriate allowance for a cost of capital that ensures optimal incentives to invest and to manage the potential risks and costs to the community of under-funding, and under-investment in, infrastructure services.

The first discussion paper in this series, released by the Commission in November 2006, outlined the determination of efficient costs as part of its overview of technical regulatory issues. That paper discussed approaches to forecasting capital and operating expenditure as part of the determination of the efficient costs. The return on capital is one of the components of the build-up of efficient costs. Given the theoretical complexity of determining the return on capital, the Commission decided to devote an entire discussion paper to this topic.

The return on capital is calculated by granting a rate of return on the financial valuation of the physical assets of the business. The financial valuation of the physical assets of the business is calculated to determine the regulated asset base (RAB). The economics and mechanics of the determination of the RAB were discussed in detail in discussion paper 1. The calculation of the rate of return to be granted on the RAB is the subject of this paper.

In determining an appropriate rate of return on capital, the regulator's focus is on granting a return sufficient to create the incentive for the regulated business to undertake efficient investment in the distribution network. The rate of return on capital should represent the opportunity cost of risky capital to the regulated business: that is, the return the regulated business could have earned had it invested in alternative investments with the same level of risk. In addition, the rate of return granted to the regulated business should ensure the regulated business's financial integrity.

The approach adopted by the Commission in previous regulatory decisions has been to calculate the rate of return using the weighted average cost of capital (WACC) formula. Under this approach, the overall return on capital is calculated in the following manner:

$$\textit{return on capital} = WACC \times RAB$$

The cost of capital is weighted by the return demanded from the two sources of funding available to the business: equity and debt. 'Equity' refers to funds raised from the owners of the business, the shareholders. 'Debt' refers to any borrowings of the business. The returns demanded by equity holders and debt holders differ, resulting in the need to calculate a WACC based on the proportions of equity and debt funding.

Other Australian regulators have also made use of the WACC to determine what rate of return should be granted to a regulated water and wastewater utility business. These include the

Independent Pricing and Regulatory Tribunal (IPART) in New South Wales, the Essential Services Commission (ESC) in Victoria and the Economic Regulation Authority (ERA) in Western Australia. In fact, the Commission can find no example of a current regulatory decision in Australia that employs an alternative model for the determination of the rate of return, although there are alternative approaches available.[1] Unless the Commission receives compelling evidence of a preferable alternative approach to determining the return on capital, the Commission intends to continue to use the WACC model.

Chapter 2 of this discussion paper provides an overview of the calculation of the WACC. The issue of whether the WACC should be determined on a pre-tax or post-tax basis is examined, and the details of the formula used to calculate the WACC are explained. The issue of whether the WACC should be based on the attributes of a specific firm or a typical firm is also discussed.

Chapter 3 summarises recent WACC decisions made by the Commission and other Australian jurisdictional regulators.

Chapter 4 outlines the method adopted to calculate parameters of the WACC for which market information is readily available.

Chapter 5 discusses the method adopted to calculate parameters of the WACC where market data is not readily available and there is debate surrounding how the variable should be set.

Chapter 6 summarises the discussion in this paper.

Chapter 7 seeks submissions from interested parties.

The appendix contains a copy of the terms of reference for the water and wastewater pricing inquiry, as issued to the Commission by the Attorney-General.

[1] In the United States it is common for regulators to determine the rate of return using the discounted cash flow model or the dividend growth model.

2 Overview of the WACC calculation

This chapter provides an overview of the elements involved in the calculation of the WACC. The first issue addressed is whether to adopt a pre-tax or post-tax calculation of the WACC. Next, the formulas used calculate the WACC are presented. Finally, there is a brief discussion of whether the WACC should be based on the characteristics of a specific firm or a typical firm.

2.1 Pre-tax or post-tax calculation

The cost of capital can be calculated before or after tax, and can be expressed in real or nominal terms. Theoretically, the calculation of the WACC as pre-tax or post-tax should have little impact on the revenue outcome for the regulated business when the building-block methodology is applied.

To calculate the WACC on a pre-tax basis, the effective tax rate is notionally used, although in practice it is often the statutory tax rate (30%) that is used.[2] In this circumstance, the payment of tax is incorporated into the rate of return, and no separate allowance for taxes is made.

Alternatively, if a post-tax WACC is used, taxes are included in the calculation of efficient costs of the business. This is achieved by calculating a separate building block to reflect the taxes likely to be paid by the business.

The rate of return on assets would in practice be lower for a post-tax WACC than for a pre-tax WACC. This is because part of the return on assets under a pre-tax WACC would be needed to pay taxes, necessitating a greater rate of return on assets to cover those unavoidable costs.

A post-tax WACC could be adopted where the regulator considered that the effective tax rate differed from the statutory tax rate. This may be the case if the business is able to reduce its effective tax rate to below the statutory rate. Or, as identified in discussion paper 1, the business may have a tax liability greater than that considered by the regulator, as a result of differences in the treatment of matters such as gifted assets between the accounts used by the regulator and the accounts used by the business for taxation purposes.

In previous decisions, the Commission has adopted a pre-tax WACC and used the statutory tax rate in its calculations. This approach assumes that the regulated business's effective tax rate is equal to the statutory tax rate. It is the Commission's preference to continue to use a pre-tax WACC. However, if it found evidence that the effective tax rate and statutory tax rate differed significantly, the Commission would consider adopting the effective tax rate rather than the statutory tax rate in its calculations.

The choice of whether a nominal or real WACC is used in the calculation of the return on capital does not impact on the overall level of return granted; it simply defines the form of regulatory model adopted. For example, if a real WACC is adopted, the cash flows of the business are forecast in real terms. Alternatively, if a nominal WACC is chosen, cash flows are forecast in nominal terms. The overall return granted is consistent between models.

[2] The 'effective tax rate' is the actual rate of tax paid by the business. This may differ from the statutory tax rate as a result of the manner in which depreciation and other matters are treated by the business.

The Commission has previously adopted a real pre-tax WACC. The Commission believes that, unless evidence is presented that demonstrates the continued use of such an approach is inappropriate, it is preferable to adopt a consistent approach in the forthcoming regulatory review.

2.2 Equations and variables

The process of calculating the WACC involves applying series of equations to determine the weighted average of returns to debt and equity in a given market. Some of the variables used in the equations are directly determined by the market, while others are determined by the regulator according to a preferred theoretical approach.

2.2.1 Equations

The WACC represents the weighted average of the returns to debt and equity. The weights are given by the relative shares of debt and equity in financing the business. The proportion of debt financing is often referred to as the 'level of gearing' of the business.

The WACC calculation is affected by the tax regime, and must take into account the level of tax paid by the business and the influence of the imputation system that operates in Australia. Under an imputation system, tax paid by the business can be credited against tax owed at the shareholder level. That is, the tax paid by the business is imputed to the shareholder, to avoid the distributed profits of the business being taxed twice.

The pre-tax nominal WACC equation taking into account the affect of taxes and the imputation system is:

$$\text{pre-tax WACC} = \frac{R_e}{1 - t \times (1 - \gamma)} \times \frac{E}{V} + R_d \times \frac{D}{V}$$

where:

- R_e is the required return to equity holders
- R_d is the required return to debt holders
- E is the value of equity
- D is the value of debt
- V is value of debt plus equity ($D + E$)
- t is the tax rate
- γ (gamma) is the value of imputation credits.[3]

Intuitively, it is easy to see that this equation is the weighted average of the return to debt and the return to equity, where the return to equity has been adjusted to take into account the availability of imputation credits in Australia. The weight attached to the return to equity is the value of equity divided by the value of debt plus equity ($E \div V$) and the weight attached to the return to debt is the value of debt divided by the value of debt plus equity ($D \div V$). These weights sum to 1. The parameters in this equation and those that follow are described in detail in chapters 4 and 5.

[3] See Officer, RR 1994 'The Cost of Capital of a Company under an Imputation Tax System', *Accounting and Finance*, May 1994, pp. 1–17. This equation appears as Equation 5 on page 5 of the article.

The return to debt (R_d) is normally calculated by adding a debt margin to the risk-free market rate:

$$R_d = R_f + DM$$

where:

- R_f is the risk-free market rate
- DM is the debt margin.

The return to equity (R_e) is normally calculated by applying the capital asset pricing model (CAPM). This approach is widely used by commercial businesses and regulators across Australia. The CAPM formula is:

$$R_e = R_f + \beta_e \times (R_m - R_f)$$

where:

- β_e (equity beta) is a measure of the correlation between a business's risk and that of the overall market
- R_m is the market rate of return.

In effect, the CAPM formula says that the return on equity for a particular business is the weighted average of the market return and the risk-free rate.

While the risk-free rate is generally observable in the market, the difference between the market return and the risk-free rate (also known as the market risk premium and calculated as $R_m - R_f$) generally reflects the long-term returns on equity in the market. The equity beta (the degree of riskiness of the business relative to the market as a whole) can itself be calculated in various ways.

Once a nominal WACC has been calculated, it can be converted into a real WACC. This conversion is undertaken in two steps. First, the consumer price index (CPI) is calculated by way of the Fisher equation:

$$CPI = \frac{(1 + R_f)}{(1 + RealR_f)} - 1$$

where:

- CPI is the consumer price index
- $Real\ R_f$ is the real risk-free rate.

Second, the nominal WACC is converted into a real WACC:

$$RealWACC = \frac{1 + Nominal\ WACC}{1 + CPI} - 1$$

2.2.2 Variables

The variables that must be determined in order to apply the WACC equations fall into two groups. The first group are the 'exogenous' variables: that is, variables determined by available market data. These variables include:

- t—tax rate
- R_f—risk-free market rate

- *Real* R_f—real risk-free rate
- *DM*—debt margin.

The Commission classifies these variables as 'exogenous' because they are determined by factors outside the discretion of the decision-making process. That is, in the Commission's opinion there are reasonable and generally accepted means of determining the appropriate value to apply for these variables on the basis of market data. Chapter 4 discusses the determination of these exogenous variables in detail.

For the second group of variables, actual market data is not readily available or there is debate regarding how the value of the variable should be determined. In this situation, the Commission must make a choice regarding the value of the variable to be adopted. These variables include:

- D (debt) and E (equity)—the level of gearing
- γ (gamma)—the value of imputation credits
- β_e (equity beta)—the correlation between a business's risk and that of the overall market
- $R_m - Rf$—the market risk premium.

Chapter 5 discusses the determination of these variables in detail.

In applying these parameters, the Commission must consider the accuracy with which the variables can be calculated. If there is a degree of uncertainty surrounding the true value of the parameter, it may be appropriate to adopt a range rather than a single value.

2.3 Specific firm or typical firm calculation

The WACC may be calculated on the basis of the characteristics of a specific business, or the characteristics of a 'typical firm'. The choice of approach has implications for some of the parameters used in the calculation of the WACC, such as the debt margin, the gearing ratio and the equity beta.

In theory, the WACC should be determined on a firm-specific basis, given that the aim is to ensure that the WACC represents a fair return on capital sufficient to ensure that the actual regulated business has the proper incentive to make efficient levels of investment in capital. In practice, determining a firm-specific WACC is fraught with difficulties. The difficulties are significant for a privatised business with publicly traded share ownership, and they are even greater in the case of a government-owned business such as ACTEW. For example, while the equity beta for a private business can be estimated from stock market data, such estimates cannot be used for businesses that are not traded on the stock market, such as subsidiaries of much larger businesses or government-owned entities.

It is important to adopt the most accurate model, because one of the goals of regulation is ensuring the business has the correct incentive to maintain efficient levels of investment, without allowing the business to earn excessive returns. A problem arises because the business's true cost of capital is unknown to the regulator. If the WACC is too low, and below the business's true cost of capital, the business has no incentive to invest in capital. Conversely, if the WACC is too high, the regulated business earns excessive returns and may have an incentive to overinvest.

2.3.1 Specific firm approach

If the goal is to determine a firm-specific WACC, the actual characteristics and financial position of the business are used. For example, the debt to equity ratio of the business is calculated from the information provided on the business's balance sheet. Establishing the debt to equity ratio appears to be a simple calculation, but examining this calculation closely illustrates that there are drawbacks to a firm-specific WACC. The main drawback is that measurement problems can arise, either from a lack of reliable or precise information, or from variability in the data.

Consider the example of the debt to equity ratio. If the business is a subsidiary of a larger organisation, does the debt to equity ratio of that larger organisation apply? If the business finances subsidiaries that are not involved in regulated markets through debt, should this affect the determination of the debt to equity ratio? The information problem is different where a firm-specific value for the equity beta is based on statistical analysis that carries with the estimate a large confidence interval. While the data may yield a 'best' estimate of the true parameter in a statistical sense, the set of reasonable values could be large. The practical result is that a firm-specific WACC may be too difficult to implement in many cases.

Adopting a firm-specific WACC leads to an interesting dilemma for regulators in Australia that exists to a much smaller extent in the United States or the United Kingdom. This dilemma is: how does a regulator deal with the fact that the regulated business is a government-owned business? Many of the regulated network businesses in Australia are government-owned or majority government-owned. This issue was identified by the ACT Council of Social Service in the Commission's most recent review of electricity distribution prices.[4]

There may be valid reasons, supported by economic theory, for treating government-owned businesses differently from privately owned businesses. This would involve continuing to provide a 'commercial' rate of return but recognising that the return required on government-provided equity may be different from return required on privately provided equity. Grant and Quiggin have highlighted this point in their recent research.[5] However, the Commission is unaware of any network regulator in Australia that treats government-owned businesses differently from privatised businesses.

2.3.2 Typical firm approach

The alternative to a firm-specific WACC is a WACC that would be appropriate for a typical firm with similar characteristics to the regulated business. This involves identifying standard values for many of the parameters of the WACC equations. For example, most regulators in Australia have adopted as a standard a 60:40 debt to equity ratio. It has been argued that such a ratio represents a more balanced debt to equity position than the positions often adopted by government-owned businesses, which can have very low levels of debt.

If an indicative approach is adopted, it is necessary to consider the nature of the 'typical' business. That is, should the indicative business be a typical water and wastewater utility, a regulated distribution business, a publicly traded company, or some other form of business? The answer is

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[4] See the transcript of proceedings from the public hearing held into pricing for electricity distribution services in the ACT on 5 February 2004. A copy of the transcript is available from the Commission's website at www.icrc.act.gov.au.

[5] See Grant S, Quiggin J 2004, 'Noise Trader and the Welfare Effects of Privatisation', *Economics Bulletin*, vol. 9, pp. 1–8; Grant S, Quiggin J 2003, 'Public Investment and the Risk Premium for Equity', *Economica*, vol. 70, pp. 1–18; and Grant S, Quiggin J 2002, 'The Risk Premium for Equity: Implications for the Proposed Diversification of the Social Security Fund', *American Economic Review*, vol. 84, pp. 1104–1115.

not self-evident, given that there are no privatised regulated water and wastewater businesses in Australia that could be used as the basis for comparisons. The outcome has been that all water and wastewater regulators have converged to use the same set of parameter values, often justifying their choices by referring to the fact that other regulators have chosen the same values. It might be questioned as to whether this is the most appropriate approach.

3 Recent water and wastewater decisions

Jurisdictional regulators in the ACT, New South Wales, Victoria, and Western Australia are responsible for determining water and wastewater tariffs in parts, if not all, of their jurisdictions.[6] This chapter summarises the recent WACC decisions on water and wastewater made by these jurisdictional regulators.

3.1 Australian Capital Territory

The Commission released its most recent price determination on water and wastewater in March 2004.[7] Table 3.1 outlines the Commission's choice of parameters leading to the final WACC of 7.0%.

Table 3.1 Parameters used by the Commission in its 2004 price determination for water and wastewater

Parameter	Value
Risk-free rate	5.62%
CPI	2.17%
Real risk-free rate	3.38%
Market risk premium	6.0%
Debt margin	1.245%
Gearing	60%
Gamma	0.50
Asset beta	0.40
Debt beta	0.06
Tax rate	30%
Equity beta (calculated)	0.90
WACC (nominal post tax)	6.51%
WACC (pre-tax nominal)	9.31%
WACC (pre-tax real)	7.0%

Source: ICRC 2004a, p. 64.

3.2 New South Wales

IPART is responsible for determining water and wastewater tariffs for Sydney Water Corporation, Hunter Water Corporation, Gosford City Council and Wyong Shire Council. Table 3.2 displays the WACC parameters applied by IPART in its most recent decisions for the water corporations (September 2005) and the councils (May 2006).[8]

[6] Geographic areas for which the jurisdictional regulator is not responsible for determining tariffs are typically rural or remote areas. In these areas, water and wastewater tariffs are often determined by local governments.

[7] Independent Competition and Regulatory Commission (ICRC) 2004a, *Final Report and Price Direction—Investigation into Prices for Water and Wastewater Services in the ACT*, Report 8 of 2004, March 2004.

[8] Independent Pricing and Regulatory Tribunal (IPART) 2005, *Sydney Water Corporation, Hunter Water Corporation, Sydney Catchment Authority: Prices of Water Supply, Wastewater and Stormwater Services, Final Report*, September 2005; and IPART 2006, *Gosford City Council, Wyong Shire Council: Prices of Water Supply, Wastewater and Stormwater Services, Report*, May 2006.

Table 3.2 Parameters used by IPART in recent price determinations for water and wastewater

Parameter	Value	
	Sydney Water Corporation and Hunter Water Corporation	Gosford City Council and Wyong Shire Council
Risk-free rate	5.20%	5.30%
CPI	2.50%	2.90%
Real risk-free rate	2.60%	2.30%
Market risk premium	5.5%–6.5%	5.5%–6.5%
Debt margin and allowance for debt raising cost	1.17%–1.27%	1.1%–1.2%
Gearing	60%	60%
Gamma	05-0.3	0.5-0.3
Asset beta	–	0
Debt beta	0	0
Tax rate	30%	30%
Equity beta	0.80–1.0	0.80-1.0
Cost of equity (nominal post-tax)	9.6%–11.7%	9.7%–11.8%
Cost of debt (nominal post-tax)	6.4%–6.5%	6.4%–6.5%
WACC (pre-tax real)	5.7%–7.1%	5.3%–6.7%

Source: IPART 2005, p. 71; IPART 2006, p. 63.

IPART's choice to adopt a range for some of the parameters results in a possible range from which the final WACC value may be selected. In this case, the regulator typically uses a degree of regulatory judgement to determine the final value of the WACC. IPART adopted a pre-tax real WACC of 6.5% in 2005 and a pre-tax real WACC of 6.3% in 2006.

3.3 Victoria

The ESC is responsible for determining tariffs for 17 water and wastewater utilities operating in Victoria, and released its most recent decision in June 2005.[9] The ESC calculates a real post-tax WACC, unlike the real pre-tax WACC adopted by the Commission and IPART. Adopting a post-tax WACC requires the regulator to specifically model taxes. This differs from a pre-tax WACC, where an effective tax rate is either modelled or estimated in some way or, as has been the case in the ACT, is assumed to be equivalent to the statutory tax rate.

It is difficult to compare meaningfully the outcomes of a post-tax WACC with those of a pre-tax WACC. However, taking the parameters as determined by the ESC and assuming a 30% tax rate, a hypothetical pre-tax WACC for the ESC can be estimated for the purposes of discussion.[10] Table 3.3 provides an estimate of this hypothetical pre-tax WACC for the ESC.

[9] Essential Services Commission (ESC) 2005b, *Metropolitan and Regional Businesses' Water Plans 2005–06 to 2007–08, Final Decision*, June 2005. See also the ESC Revenue Model available at www.esc.vic.gov.au.

[10] The ESC did not calculate a pre-tax real WACC. The hypothetical is the pre-tax real WACC calculated by the Commission, based on the WACC parameters the ESC adopted for its post-tax WACC (ESC 2005b, p. 47) and a 30% tax rate.

Table 3.3 Parameters for a hypothetical pre-tax real WACC based on the ESC's 2005 price determination for water and wastewater

Parameter	Value
Risk-free rate	5.285%
CPI	2.53%
Real risk-free rate	2.67%
Market risk premium	6.00%
Debt margin	1.16%
Gearing	60%
Gamma	0.5
Asset beta	0%
Debt beta	0
Tax rate	30%
Equity beta	0.75
WACC (pre-tax real)	5.64%

3.4 Western Australia

The ERA is responsible for regulating water and wastewater services provided by the Water Corporation operating in Perth and regional centres, AQWEST operating in the Bunbury–Wellington region, and Busselton Water operating in Busselton. Using an approach similar to those of the Commission and IPART, the ERA adopted a pre-tax real in its November 2005 decision, as shown in Table 3.4.[11]

Table 3.4 Parameters used by the ERA in its 2005 price determination for water and wastewater

Parameter	Value	
	Water Corporation	AQWEST and Busselton Water
Risk-free rate	5.23%	5.23%
CPI	2.74%	2.74%
Real risk-free rate	2.42%	2.42%
Market risk premium	6.00%	6.00%
Debt margin and allowance for debt raising cost	1.125%	1.125%
Gearing	60%	40%
Gamma	0.50	0.50
Asset beta	0.43	0.44
Debt beta	0.19	0.19
Tax rate	30%	30%
Equity beta	0.80	0.60
Cost of equity (nominal post-tax)	10.03%	8.83%
Cost of debt (nominal post-tax)	6.36%	6.36%
WACC (pre-tax real)	5.63%	5.87%

Source: ERA 2005, pp. 199–200.

[11] Economic Regulation Authority (ERA) 2005, *Final Report: Inquiry on Urban Water and Wastewater Pricing*, November 2005.

3.5 Comparisons between jurisdictions

The WACC for a regulated business is calculated at a specific point in time. It is difficult to compare the final WACC decisions of the jurisdictional regulators, given that the risk-free and real risk-free rates used in the determination of the WACC vary over time. Generally, regulators select a date as close as practicable to the start of the regulatory period in question. For example, in the Commission's most recent determination on water and wastewater pricing, released in March 2004 for the period 1 July 2004 to 30 June 2008, the WACC was calculated using data available as of 27 February 2004.[12]

However, some rough comparisons can be made by applying the risk-free rate and real risk-free rate that applied at the time of the Commission's most recent decision to the other parameters chosen by the jurisdictional regulators in making their respective decisions. For example, IPART would have calculated a WACC within the range of 6.5% and 7.9% for Sydney and Hunter water corporations, and a WACC within the range of 6.4% and 7.9% for Gosford and Wyong councils. The ESC would have calculated a WACC of 6.5% (using the Commission's earlier assumptions regarding the treatment of taxation). The ERA would have calculated a WACC of 6.6% for the Water Corporation and 6.9% for AQWEST and Busselton Water. As noted above, the Commission adopted a WACC of 7.0%, which is slightly higher than the ESC and ERA equivalent rates, and falls within the IPART range.

[12] ICRC 2004a, p. 61.

4 Market-determined variables

The variables required in the calculation of the WACC that the Commission views as being determined exogenously are:

- t—tax rate
- R_f—risk-free market rate
- *Real* R_f—real risk-free rate
- *CPI*—consumer price index (calculated from the risk-free rate and the real risk-free rate)
- *DM*—debt margin.

The use of the term 'exogenous' does not imply that the determination of these variables is something that the Commission need not be concerned about or that, in fact, requires no decision on the part of the Commission. Rather, it means that the Commission believes that there is market information that is sufficient to determine the value for the variable in the calculation of the WACC. It is the market information, such as the publicly available information on yields on government bonds, that is exogenous to the Commission's decision making.

This chapter discusses how the available market information is translated into the relevant variables.

4.1 Tax rate

The tax rate represents the rate of tax paid by the business on profits. The Commission has two choices when choosing the appropriate methodology for determining a tax rate to apply in the WACC calculation. The Commission could adopt the statutory tax rate, or the Commission could model or estimate the effective tax rate.

Regulators in Australia that have adopted a pre-tax WACC have generally used the statutory tax rate. The Australian Competition and Consumer Commission (ACCC) and the Australian Energy Regulator have employed a post-tax WACC in their various electricity and gas determinations, and consequently have calculated an effective tax rate as part of their modelling of efficient projected tax liabilities. The ESC has also adopted a post-tax WACC.

The current statutory company tax rate in Australia is 30%. However, it may be the case that a regulated business's effective tax rate is different from the statutory tax rate. In general, the effective tax rate will be lower than the statutory tax rate. This may occur as a result of tax concessions such as the treatment of accelerated depreciation.

Determining an effective tax rate is typically done by modelling the expected revenues, costs and other activities of the business that affect the amount of tax to be paid by the business. However, modelling the effective tax rate is an information-intensive exercise in which the possibility of information asymmetry exists. The business clearly has better information about its tax liabilities than the regulator has.

This an example of the issues raised in Chapter 2 in the discussion of whether the WACC should represent the return for a typical business or for the actual business. The Commission takes the

view that, in the absence of evidence that there is a more appropriate approach, it will continue to use the statutory tax rate of 30%, as this is consistent with a pre-tax real WACC of the form adopted in the 2004 price determination.

4.2 Risk-free rate

The risk-free rate enters into the calculation of the WACC through the calculation of both the return on equity and the return on debt, and in the calculation of the CPI. The risk-free rate used to calculate the returns on equity and debt is the nominal risk-free rate. The return on debt is the risk-free rate plus the debt margin, and the risk-free rate is used in determining the return on equity through the CAPM equation. The CPI is calculated as the difference between the nominal and real risk-free rates, using the Fisher equation.

Government bonds are generally considered to be risk-free investments. Therefore, the yield on a Treasury Fixed Coupon Bond with 10 years to maturity is taken to represent the risk-free rate. However, because bonds are issued irregularly, it is unlikely that a bond with exactly 10 years to maturity will be issued on the day the WACC is calculated. To address this problem, the approach adopted previously by the Commission has been to calculate the risk-free rate based on the yield of a hypothetical Treasury Fixed Coupon Bond due to mature 10 years from the day the WACC is calculated.

The Commission calculates the yield on a hypothetical bond with a maturity of 10 years from the day the WACC is calculated by linearly interpolating the yield of the two Treasury Fixed Coupon Bonds with maturities closest to either side of 10 years. The Commission uses the yield on the Treasury Fixed Coupon Bonds published by the Reserve Bank of Australia (RBA) and available on its website.[13] To reduce the variability that may be experienced due to short-term fluctuations in yields, the Commission has adopted an average of yields for the 20 business days up to the day the WACC is calculated.

The Commission intends making a final decision regarding the WACC to be used in the determination of the return on capital component of the total efficient costs of ACTEW in March 2008. In that case, should the Commission calculate the risk-free rate using a hypothetical 10-year bond, it would interpolate the risk-free rate from the Treasury Fixed Coupon Bonds due to mature in February 2017 and March 2019.[14] However, an alternative approach would be to adopt the risk-free rate of the Treasury Fixed Coupon Bonds with the longest time to maturity available.

4.3 Real risk-free rate

In addition to the risk-free rate, the real risk-free rate is required in the calculation of the CPI. The real risk-free rate is calculated as of the same day as the risk-free rate. The real risk-free rate is determined from the yield on Treasury Capital Indexed Bonds. Treasury Capital Indexed Bonds are adjusted for inflation and therefore represent the real return on a risk-free investment.

In calculating the CPI, it is necessary to ensure that the yields for the risk-free rate and real-risk free rate are comparable. Therefore, it is necessary to create a hypothetical real risk-free bond with a maturity date equal to that of the risk-free bond. Assuming a 10-year risk-free bond is adopted by

[13] See www.rba.gov.au/Statistics/indicative.html.
[14] The Treasury Fixed Coupon Bonds with maturity dates nearest to March 2018 (10 years from the expected date of the final decision) are due to mature on 15 February 2017 and 15 March 2019.

the Commission when making its WACC decision in March 2008, a hypothetical 10-year real risk-free rate would be calculated by interpolating the yield using the Treasury Capital Indexed Bonds with maturities of August 2015 and August 2020.[15] The real risk-free rate would be calculated in a similar manner to the risk-free rate, using an average of yields over 20 business days as published by the RBA. Once the real risk-free rate has been established, the implied forward-looking CPI can be calculated.

An alternative to calculating a 10-year hypothetical bond for both the Treasury Fixed Coupon Bonds and Treasury Capital Indexed Bonds would be to adopt the bond with the longest time to maturity available. At present, given that it is necessary to compare bonds with the same maturity date, this would entail adopting a risk-free rate based on the maturity of the Treasury Fixed Coupon Bond in March 2019 and interpolating a real risk-free rate from the Treasury Capital Indexed Bonds with maturities of August 2015 and August 2020.

4.4 Consumer price index

The CPI calculated using the risk-free rate and real risk-free rate is an implied forwarding-looking CPI, because it represents the CPI as projected forward using the financial markets. It is calculated using the Fisher equation:

$$CPI = \frac{(1+R_f)}{(1+RealR_f)} - 1$$

Once the CPI has been calculated, it is used to convert the nominal WACC into a real WACC using the following equation:

$$RealWACC = \frac{1+Nominal\,WACC}{1+CPI} - 1$$

4.5 Debt margin

The debt margin represents the margin above the nominal risk-free rate that a business must pay to secure debt financing. Intuitively, a business must pay a premium above the risk-free rate to compensate the lender for the probability of default. The debt margin a business pays depends on the perceived riskiness of the business, with low-risk businesses able to secure debt financing at a cheaper rate than more risky businesses.

For the purposes of obtaining debt funding, the riskiness of a business is often determined by credit rating agencies such as Standard and Poor's, Moody's, or Fitch Ratings. These agencies typically base their credit ratings on an analysis of the relevant business's financial records, the industry in which the business operates, and the prospects of the business.

There are two approaches that may be adopted for determining the credit rating of a regulated business. The regulator can adopt a benchmark credit rating that it considers appropriate for the regulated business in question. Typically, regulators adopt a credit rating of BBB, BBB+ or A. The alternative approach is to determine the credit rating of the business based on financial modelling that takes into account the outcomes of the regulatory review.

[15] The Treasury Capital Indexed Bonds with maturity dates nearest to March 2018 (10 years from the expected date of the final decision) are due to mature on 20 August 2015 and 20 August 2020.

Once the credit rating of the business has been determined, the debt margin is obtained from market data, generally from sources such as CBASpectrum or Bloomberg. In addition to the debt margin, an allowance is sometimes granted to cover transaction costs. This allowance is often referred to as 'debt-raising costs'.

In its water and wastewater price determination released in March 2004, the Commission granted a total debt margin of 1.245%. This was based on a benchmark credit rating of BBB+ and consisted of a 1.12% debt margin plus 0.125% allowance for debt-raising costs.[16] The Commission noted that, at that time, the ACCC included debt-raising costs as an operating cost, rather than increasing the debt margin to account for debt-raising costs.[17] The Commission welcomes submissions on the treatment of debt-raising costs as either an addition to the debt margin or a separate operating cost.

IPART, in its 2006 decision, adopted a total debt margin in the range of 1.1% to 1.2%, including an allowance of 0.125% for debt-raising costs. The approach adopted by IPART was to use a 20-day average of yields on BBB+ to BBB corporate bonds with a 10-year maturity. The data was obtained from CBASpectrum. The 20-day average gave a range of between 100.7 and 109.6 basis points for BBB+ and BBB corporate bonds respectively. To this, debt-raising costs (based on consultancy reports by ABNAmro and Westpac) of 12.5 to 25 basis points were added. This resulted in a (rounded) range of 1.1% to 1.2% for the final debt margin, including debt-raising costs.[18]

In their most recent decisions, the ESC in Victoria and the ERA in Western Australia adopted a similar approach to IPART. However, they considered the 20-day average yield (to a predetermined date) on bonds rated BBB+ only. Debt-raising costs were then added.[19]

The ACCC, in its 2004 statement of regulatory principles for electricity transmission revenues, adopted a benchmark credit rating of A and an averaging period (between five and 40 days) equal to that adopted in the calculation of the risk-free rate. The ACCC also adopted a bond length of equal maturity to that adopted in the calculation of the risk-free rate, to maintain consistency between the manners in which the risk-free rate and the debt margin are calculated.[20]

The approach adopted by Australian regulators to determine the debt margin can be summarised as follows. First, the credit rating of the regulated business is determined, either by determining a benchmark credit rating considered appropriate to the regulated business or by calculating the credit rating of the business based on financial modelling taking into account the outcomes of the regulatory review. Second, the debt margin for a business with the relevant credit rating is determined from market data. The debt margin is calculated in such a way as to ensure consistency with the method adopted in calculating the risk-free rate: that is, the same averaging period and the same length to maturity of corporate bonds are used. Third, an allowance for debt-raising costs may be added.

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[16] ICRC 2004a, pp. 58–61.
[17] The Commission notes that in the most recent release by the Australian Competition and Consumer Commission (ACCC) (*Draft Decision, Draft Decision, Revised Access Arrangement by APT Petroleum Pipelines Ltd for the Roma to Brisbane Pipeline*, 23 August 2006, pp. 53–54) an allowance for debt-raising costs was granted as an addition to the debt margin rather than a separate operating cost.
[18] IPART 2006, p. 102. The same methodology was adopted in IPART's recent reviews of the Sydney Water Corporation and Hunter Water Corporation.
[19] ESC 2005b, p. 47; and ERA 2005, pp. 196–197.
[20] ACCC 2004, *Decision, Statement of Principles for the Regulation of Electricity Transmission Revenues—Background Paper*, 8 December 2004, p. 113.

The ownership of ACTEW is relevant to this question. ACTEW is fully owned by the ACT Government and, as such, may be able to borrow at a lower rate than the rates indicated by either benchmarking or financial modelling. This may be the case because of the reduced credit risk the financial market typically assigns to government-owned businesses relative to privately operated businesses. If ACTEW was indeed able to borrow at a rate lower than that determined by the Commission, the return on debt would be overstated and ACTEW would receive an excessive return on capital. This issue is related to the Commission's consideration of whether it should consider an actual or hypothetical business when undertaking the next pricing review.

5 Commission-determined variables

The variables required in the calculation of the WACC where actual market data is not readily available or there is debate regarding the value of the variable include:

- D (debt) and E (equity)—the level of gearing
- γ (gamma)—the value of imputation credits
- β_e (equity beta)— the correlation between a business's risk and that of the overall market
- $R_m - Rf$ —the market risk premium.

This chapter discusses the theoretical approaches the Commission will choose from in determining these variables.

5.1 Level of gearing

The overall cost of capital is the weighted sum of the returns demanded by debt and equity holders. 'Debt' refers to funds raised from borrowings, whereas 'equity' refers to funds raised from the shareholders, or owners, of the business. The proportion of debt to equity is referred to as the 'level of gearing' of the business.

Theoretically, in the calculation of the WACC, the level of gearing should be based on the current market value of debt relative to equity of the business being considered.[21] In practice, difficulties arise, because it can be problematic to isolate the financial records of the actual business being regulated. For example, ACTEW has business dealings apart from the provision of water and wastewater services, making it difficult to separately identify the gearing level of the water and wastewater business. In addition, the values of equity and debt should be based on current market values. However, for a business such as ACTEW that is not publicly traded on the stock market, it is difficult to determine accurately the current market value of equity (which is normally calculated as the current market price of ordinary shares multiplied by the number of shares).

To overcome the difficulties of determining the actual level of gearing of a regulated business, the convention is to adopt a 60:40 gearing ratio. However, the Commission welcomes submissions expressing other views on determining the appropriate ratio.

5.2 Value of imputation credits

Australia introduced an imputation taxation regime on 1 July 1987.[22] Under an imputation system, profits of companies are taxed only once, as shareholders who receive dividends are able to claim credits for any tax paid at the company level. This differs from a classical taxation regime, under which profits are taxed fully at the company level before being taxed again in the hands of the shareholders. In essence, an imputation system reduces a company's tax burden, because any tax paid by the company is imputed to the shareholder.

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[21] Brealey R, Myers S, Partington G, Robinson D 2005, *Principles of Corporate Finance*, first Australian edition, McGraw-Hill, Sydney, pp. 565–567. Chapter 19 (pp. 561–604) of this text discusses the calculation of the WACC under a range of scenarios.

[22] A discussion of the introduction of the imputation system can be found on the Australian Taxation Office website at www.ato.gov.au.

Imputation credits affect the calculation of the post-tax required return to equity, because an investor who receives a tax credit will accept a lower return compared with an investor who receives no tax credit. Therefore, it is necessary to account for the impact of the imputation system on the business's return on equity. Australian regulators generally employ the adjustment to the return on equity to account for the introduction of an imputation system identified by Officer in 1994.[23]

The value of imputation credits can range between zero and one and is calculated as:

$$\gamma = U \times \frac{IC}{Tax}$$

where:

- γ (gamma) is the value of imputation credits
- U is the weighted average of investors' utilisation rate of imputation credits
- IC is the imputation credits assigned to the business during the period
- Tax is the amount of tax paid by the business during the period.[24]

For example, the value of gamma for a business with profits of $100, which paid $30 tax and received imputation credits of $30, would simply be the utilisation rate U, as $IC \div Tax$ would equal one.

A value of gamma of zero signifies that any franked distributions by the business were unable to be utilised by shareholders, whereas a value of one signifies that franked distributions could be fully utilised by shareholders. Imputation credits can be utilised only by those who are classified as Australian residents for taxation purposes.

The value of gamma has a significant effect on the final calculation of the WACC. In the Commission's 2004 price determination, a value for gamma of 0.5 was adopted, which led to a final WACC of 7.0%. Had zero been adopted and the remaining parameters remained unchanged, the final WACC would have been 8.1%. This compares to a WACC of 6.2% had a gamma of one been selected and the remaining parameters remained unchanged. Given the significance of gamma, there has been much debate over its value.

In its recent decisions, IPART selected a value for gamma within the range of 0.3 to 0.5. The ESC and ERA both selected a value of 0.5.

The value of gamma can be calculated on a theoretical or empirical basis. If a theoretical approach is adopted, the question of the extent to which Australian equity markets are integrated with international equity markets, and the consequent effect on the value of gamma, is raised. If it is considered that the Australian equity market is segregated from international markets, the return on equity calculated through the CAPM should be based on domestic values for the required parameters, including gamma. However, if it is considered that the Australian equity market is integrated with international markets, the return on equity calculated through the CAPM should incorporate international values for the relevant parameters.

[23] Officer 1994, pp. 1–18.
[24] Lally M 2003, 'Regulation and the Cost of Equity Capital in Australia', *Journal of Law and Financial Management*, November, vol. 2, no. 1, p. 30.

Alternatively, if the value of the gamma is considered on an empirical basis, the debate often centres on the value that equity markets place on imputation credits. This analysis is generally conducted by way of an 'event study' focusing on the impact of imputation credits on cum-dividend and ex-dividend share prices.[25]

5.2.1 Theoretical arguments

The theoretical arguments surrounding the value of gamma are based on the extent to which the Australian equity market is integrated with international equity markets. Consider the situation where the Australian equity market is completely segregated from international equity markets. In this instance, a return on equity calculated through the CAPM should be based on domestic values for the required parameters. An Australian equity market segregated from international equity markets implies that all shareholders will be able to utilise any franking credits they receive on distributions. Assuming the business receives imputation credits equal to the value of tax paid, a value of gamma equal to one should be adopted.

For consistency, a domestic value of the market risk premium, calculated as the return of the market less the risk-free rate, should be adopted. Similarly, the value of the equity beta should be defined on an Australian basis. This is the approach recommended by Lally.[26]

Lally recommends this approach despite acknowledging that the assumption that the Australian equity market is segregated from international markets is false. Lally argues that the alternative—whereby it is assumed that the markets are fully integrated, implying investors will hold risky assets in both foreign and local markets in proportion to their market values—is also not the case. Referring to research on investor preferences, Lally states that 'investors in most major markets hold at least 90% of their risky asset holdings in home country assets.'[27] The phenomena that, despite the integration of financial equity markets, investors exhibit a pronounced preference for local equities, is referred to as the 'home bias puzzle'.[28] Based on the evidence of that preference, Lally recommends the use of a CAPM that assumes that equity markets are segregated, implying a gamma equal to one.

The alternative is the situation where Australia is completely integrated with international equity markets. Given that franking credits can be utilised only by investors that are Australian residents for taxation purposes, and that the pool of investment by Australian investors is insignificant in comparison to the pool of international investment funds (approximately 1%), a gamma of zero would be appropriate.[29]

Calculating the return on equity on the basis of an internationally integrated equity market requires the adoption of an international market risk premium, as well as an equity beta calculated on an international basis. While Lally recommended the calculation of a domestic return on equity, he

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[25] Cum-dividend and ex-dividend refer to shares traded with and without entitlement to the next dividend payment. Event studies attempt to determine the value that markets place on imputation credits by analysing the change in price of a share as it moves from cum-dividend to ex-dividend status.
[26] Lally 2003, pp. 29–42.
[27] Lally 2003, p. 31.
[28] See Cooper I, Kaplanis E 1994, 'Home Bias in Equity Portfolios, Inflation Hedging and International Capital Market Equilibrium', *The Review of Financial Studies*, no. 7, pp. 45–60; and Tesar L, Werner I 1995, 'Home Bias and High Turnover', *Journal of International Money and Finance*, no. 14, pp. 467–492.
[29] NERA Economic Consulting, *International versus Domestic CAPM*, June 2003, p. 12.

acknowledged that, should an international approach be adopted, it would be necessary to define the market risk premium and equity beta on an international basis.[30]

In 2004, Koedijk and van Dijk stated:

> In the past two decades, analysts have observed increasing integration of international financial markets. Barriers to international investment among developed economies have slowly but steadily diminished. Hence, global risk factors are increasingly important for portfolio selection and asset pricing. Recent empirical evidence indicates, specifically, that global factors—notably, exchange rates—affect the pricing of stocks in industrialized countries.
>
> These developments suggest that an international capital asset pricing model (ICAPM) should be used for computing a company's cost of equity capital.[31]

In summary, the theoretical arguments are divided, suggesting a value of gamma equal to either zero or one. This is hardly a helpful conclusion. However, there is some suggestion that there is a move away from the home base preference (that is, that Australian and international markets are becoming more integrated), although this process of change is still evolving. While there may be stronger theoretical evidence that the value of gamma should be equal to one given current investor behaviour, as financial markets become increasingly integrated over time the theoretical prediction of gamma will move towards zero.

5.2.2 Empirical arguments

Empirical studies that attempt to determine the value of imputation credits, and consequently the value of gamma, generally analyse the responses of the market to the issuing of dividends and how these responses reflect the value of imputation credits. Cannavan and others estimate the value of imputation credits 'by inferring the value of cash dividends and tax credits from the relative prices of share futures and the individual stocks on which those futures are written', and conclude that:

> Our results are consistent with the notion that nonresidents are the marginal price-setting investors in large Australian firms. The strong relationship between dividend yield and the value of tax credits is consistent with the idea that the costly transfer of the credits provides a source of value to nonresidents. Since the 1997 tax law amendments, which effectively prevent the transfer of imputation tax credits, were introduced, the implied value of tax credits has been insignificantly different from zero. [32]

Beggs and Skeels investigated the impact of cash dividends and franking credits on ex-dividend share prices by analysing drop-off ratios in the Australian market between 1986 and 2004.[33] They concluded that 'the franking credit drop-off ratios were not significantly different from zero for much of the sample data.'[34] However, Beggs and Skeels also analysed the impacts of taxation changes that have occurred since the introduction of imputation credits in 1987 and noted that:

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[30] Lally 2003, p. 30.
[31] Koedijk KG, van Dijk MA 2004, 'Global Risk Factors and the Cost of Capital', *Financial Analysts Journal*, March–April, p. 32–38. The Commission notes the ICAPM model developed by Koedijk and van Dijk includes additional parameters to those considered to date by the Commission, such as exchange rates. The Commission's intention in providing this citation is to highlight the debate surrounding the use of an international version of the CAPM, rather than provide an alternative model.
[32] Cannevan D, Finn F, Gray S 2004, 'The Value of Dividend Imputation Tax Credits in Australia', *Journal of Financial Economics*, vol. 73, no. 1, pp. 167–197.
[33] Beggs DJ, Skeels CL 2006, 'Market Arbitrage of Cash Dividends and Franking Credits', *Economic Record*, September, vol. 82, no. 258, pp. 239–252.
[34] Beggs, Skeels 2006, p. 249.

> the year 2000 tax change that allowed for a rebate of unused franking credits was of special interest. This tax regime change permanently increased the value of franking credits to the marginal investor, and raised the estimated gross drop-off ratio.[35]

Hathaway and Officer found that the Australia-wide gamma, covering all companies, for the period 1988 to 2002 was 0.355.[36] They concluded that, while the value of imputation credits cannot be measured accurately, 'ignoring them is tantamount to assuming a zero value for credits and this certainly is a gross error.'[37]

5.2.3 Summary

The recent empirical work undertaken on the value of gamma seems to suggest a value for gamma toward the lower end of the feasible range of between zero and one. However, the theoretical arguments are polarised, recommending either a gamma of zero or a gamma of one. In the Commission's previous determination the value of gamma was set at 0.5 as this represented a reasonable value given the divergent theoretical and empirical values. The Commission seeks submissions on the appropriate value for gamma in the WACC calculation.

5.3 Equity beta

The equity beta (β_e) represents the degree of riskiness (non-diversifiable risk) of the business relative to that of the market as a whole. Equity betas are generally estimated by analysing the movement in a particular business's share price relative to that of the market. Hence, the beta indicates the degree at which a business's risk correlates with the risk of the market portfolio. The lower the equity beta the less volatile the share price compared to the market portfolio.

The value of the equity beta has a considerable affect on the final value of the WACC. In its 2004 price determination, the Commission calculated a WACC of 7% based on an equity beta of 0.9. Table 5.1 illustrates how the value of the WACC would have been altered if different values for the equity beta had been selected

Table 5.1 Effect of the equity beta on the WACC outcome

Equity beta	0.0	0.5	0.9	1.0	1.5
WACC	4.5%	5.9%	7.0%	7.3%	8.6%

Firms that produce financial market statistics estimate equity betas for businesses listed on the stock exchange. The equity beta is normally calculated by analysing the returns of the particular stock relative to the returns of the market over a designated period of time. However, for an unlisted business, such as ACTEW, the estimation of the equity beta is problematic.

A common approach is to base the equity beta of an unlisted business on that of a comparable listed business, or the average equity beta of a range of comparable businesses. In this case, it may be necessary to adjust the equity beta of the comparable listed business or businesses for differences in the gearing levels relative to those of the unlisted business, given that a business's level of gearing affects the riskiness of its returns to equity holders. That is, the riskiness of returns

[35] Beggs, Skeels 2006, p. 249.
[36] Hathaway N, Officer B 2004, *The Value of Imputation Tax Credits—Update 2004*, Capital Research, Melbourne, p. 7.
[37] Hathaway, Officer 2004, p. 26.

to equity holders increases as the level of debt increases, because, other things remaining unchanged, a greater proportion of the earnings of the business must be assigned to debt payments prior to any distributions to equity holders. This acts to increase the risk of the return to equity holders. The process of adjusting the equity beta for different gearing levels is referred to as the 'de/re-levering process'.

The de/re-levering process is described in the ACCC's statement of regulatory principles for electricity transmission revenues as follows:

> The first step in the de/re-levering process is to de-lever an equity beta for a firm with observable returns from the market. The market equity beta is taken from a listed comparable firm and is then de-levered using the listed firm's actual gearing level to determine the asset beta of the firm (the beta of the firm without debt financing).
>
> The asset beta represents the sensitivity of the operating cash flows generated by the assets. If a firm is financed entirely by equity (i.e. no debt) then the asset beta is equal to the equity beta.
>
> The asset beta is then used to re-lever with a benchmark gearing level to obtain a comparable benchmark equity beta for the regulated firm.[38]

The formula proposed by the ACCC to re-lever to the benchmark gearing level of 60:40 is the Monkhouse formula:

$$\beta_e = \beta_a + (\beta_a - \beta_d) \times \left(1 - \frac{R_d}{(1+R_d)} \times (1-\gamma)t\right) \times \frac{D}{E}$$

where:

- β_a is the asset beta, as described above
- β_d is the debt beta, described as 'the systematic risk of debt. It represents that part of systematic risk in business operations transferred from equity holders to providers of debt.'
- R_d is the required return to debt holders
- γ is the value of imputation credits
- t is the tax rate
- D is the value of debt
- E is the value of equity.[39]

While observing that in revenue cap decisions it has consistently applied an equity beta value of one, the ACCC notes that:

> The revenue cap decisions have generally stated that this figure of 1 is approximately equal to re-levering an asset beta of 0.4, based on the assumed 60:40 gearing ratio and a debt beta of 0. However, the de/re-levering process is not actually undertaken from observed market data to obtain an equity beta of 1.[40]

In the statement of regulatory principles for electricity transmission, the ACCC again adopted a value of one for the equity beta.[41]

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[38] ACCC 2004, pp. 102–103.
[39] ACCC 2004, pp. 102–103.
[40] ACCC 2004, p. 103.
[41] ACCC 2004, p. 108.

The approach whereby the ACCC appears to estimate the values for the asset beta and debt beta in order to estimate the value of the equity beta via the Monkhouse formula (without firstly de-levering a comparable business) is similar to the approach taken by the Commission. During its most recent review of ACTEW's water and wastewater services, the Commission did not de-lever a comparable business. Rather, it calculated an equity beta of 0.9 based on an estimated asset beta of 0.4 and an estimated debt beta of 0.06.[42] This was also the approach adopted by the Commission in its most recent electricity distribution decision. The Commission adopted a range for the equity beta of 0.9 to 1.09 in its recent gas distribution decision, while noting that the lower value was based on an asset beta of 0.4 and a debt beta of 0.06.[43]

An alternative approach is adopted by IPART. IPART does not appear to either undertake a de/re-levering process or estimate values for the asset beta and debt beta. Instead, IPART simply estimates a value for the equity beta based on its judgement of a range of relevant issues, including risk relative to that of comparable listed companies, risk relative to that of other regulated industries, and evidence from overseas. In its most recent water decisions, IPART also considered whether retail water businesses face differing risk profiles to other regulated businesses, such as electricity and gas distribution businesses, but concluded there was no evidence to suggest this was the case. IPART estimated a range for the equity beta of 0.8 to 1.0.[44]

The ESC determined a value for the equity beta for the Victorian water businesses of 0.75.[45] The ESC did not adopt any specific method to determine the value of the equity beta. Rather, it considered a range of matters, including:

- the submissions from the regulated water businesses
- capital market data from Australian energy infrastructure businesses
- capital market data from listed water companies in the United States and United Kingdom
- the relative risk of water businesses compared to energy businesses
- recent regulatory decisions.[46]

The ERA in Western Australia determined values for the equity beta of 0.8 for the Water Corporation and 0.6 for AQWEST and Busselton Water.[47] The ERA appears to have placed a large degree of weight on the precedents set by other regulators. While the ERA provided values for the asset beta and debt beta, it is unclear whether these were used to calculate the equity beta or adopted for completeness subsequent to the decision regarding the equity beta.

There is limited empirical evidence available for water and wastewater businesses. However, guidance as to the appropriateness of the final value of the equity beta can be obtained by comparing observed equity betas from listed businesses operating in regulated network industries both in Australia and internationally. The Allen Consulting Group (ACG) prepared a report for the ACCC on the value of the equity beta for regulated gas transmission businesses.[48] ACG concluded

[42] ICRC 2004a, pp. 57–58.
[43] ICRC 2004b, *Final Decision—Review of Access Arrangement for ActewAGL Natural Gas System in ACT, Queanbeyan and Yarrowlumla*, October 2004, pp. 152–53 and pp. 177–185.
[44] IPART 2005, pp. 70–75 and p. 174; and IPART 2006, pp. 62–63 and p. 104.
[45] ESC 2005b, pp 45–47.
[46] ESC 2005a, *Water Price Review Volume 1, Metropolitan and Regional Businesses' Water Plans—Draft Decision 2005–06 to 2007–08*, March 2005, pp. 86–91.
[47] ERA 2005, pp. 195–201. It should be noted that the equity beta of 0.6 adopted for AQWEST and Busselton Water is based on a gearing ratio of 40:60. The ERA states that this is equivalent to an equity beta of 0.8 for a 60:40 gearing ratio.
[48] Allen Consulting Group 2002, *Final Report, Empirical Evidence on Proxy Beta Values for Regulated Gas Transmission Activities*, July 2002.

that the evidence from the Australian market implied an equity beta of 0.7, based on a level if gearing of 60%.[49] However, ACG cautioned against relying on this estimate, given that it was calculated using data from four listed businesses only.

The comparable equity betas calculated in the report for businesses operating overseas were approximately 0.16 for United States businesses, 0.02 for Canadian businesses, and 0.15 for United Kingdom businesses.[50] The calculated equity betas for the businesses analysed by ACG that were involved in water and wastewater services were all from the United Kingdom. These businesses and their respective calculated re-levered equity betas were: Anglian Water 0.01; United Utilities 0.09; Kelda Group 0.01; Pennon Group –0.28; and Severn Trent –0.26.[51]

It is interesting to note the comments made by the ACCC regarding the value of the equity beta in its recent draft decision on the Roma to Brisbane gas pipeline, as it is likely these comments provide an insight into the approach of the ACCC in future.[52] An equity beta of one was adopted on the grounds of achieving the objectives of the gas code during a time of transition in the regulatory framework for electricity and gas. However, the ACCC cited the findings of the previously mentioned ACG report, which suggested an equity beta of 0.7, and noted its conclusion that the information from comparable businesses operating in other countries supported the view that Australian estimates are not understated.

In addition, the ACCC derived re-levered equity betas for five comparable Australian firms. Using data available as of December 2005, an equity beta of 0.27 was calculated. The market data available as of March 2006 indicated an equity beta of 0.23. The ACCC concluded that this 'suggests that the ACCC has been conservative with its equity beta estimate of one in previous regulatory decisions.' [53] Furthermore, the ACCC analysed the value of the equity beta of the comparable businesses over time and concluded that the equity beta had been relatively stable and below 0.3 from the end of 2002 to 2005.[54] The ACCC stated that the latest empirical evidence 'indicates that it may be appropriate to adopt an equity beta value of less than one.'[55]

The ACCC concluded that, in the future:

> the ACCC may place greater weight on contemporary market information in deriving a best estimate of equity beta in accordance with s. 8.2(e) of the code, noting that this may lead to an equity beta value of less than one.[56]

The range of possible approaches adopted by regulators to determine the equity beta includes undertaking the de/re-levering process based on the observed equity beta of a comparable business, independently estimating values for the asset beta and debt beta and calculating an equity beta through the Monkhouse formula, and directly estimating the equity beta based on empirical results and previous regulatory decisions. Guidance on the values produced from each of these approaches can be obtained by comparing the final value of the equity beta with those observed from listed businesses, both domestic and international, and decisions in regulated sectors including water and wastewater, electricity and gas. The trend that appears to be emerging among regulators is a

[49] Allen Consulting Group 2002, p. 5.
[50] Allen Consulting Group 2002, p. 40. These equity betas were based on a debt beta of zero and a gearing ratio of 60%, and excluded the tax term from the leveraging formula. As such, they are comparable.
[51] Allen Consulting Group 2002, Appendix B, pp. 2–3. Each of these businesses was re-levered to a gearing ratio of 60% and as such they are comparable.
[52] ACCC 2006, pp. 40–67.
[53] ACCC 2006, p. 59.
[54] ACCC 2006, pp. 60–61.
[55] ACCC 2006, p. 62.
[56] ACCC 2006, p. 63.

preference for adopting equity betas of less than one. The recent comments by the ACCC lend weight to this notion.

5.4 Market risk premium

The market risk premium (MRP) is defined as the difference between the return on the market portfolio and the return on the risk-free rate ($R_m - Rf$). The MRP enters into the calculation of the WACC through the determination of the return on equity, which is given by the CAPM formula.

The CAPM formula is:

$$R_e = R_f + \beta_e \times (R_m - R_f)$$

where:

- R_e is the nominal post-tax cost of equity
- R_f is the risk-free market rate
- β_e is a measure of the correlation between a business's risk and that of the overall market
- R_m is the market rate of return.

Thus, the return on equity is the risk-free rate plus the MRP multiplied by the equity beta. If the equity beta is equal to one, a 1% increase in the MRP results in a 1% increase in the return on equity.[57]

The market risk premium is the parameter in the WACC calculation for which there seems to be agreement among regulators across Australia. Most regulatory decisions in Australia have included an MRP of 6%, while IPART in its 2005 water and wastewater price determination adopted a range for the MRP of 5.5% to 6.5%, which centres on 6%.[58]

However, while there is uniformity among regulators, there is very little consensus in the economics and finance literature about the true value of the MRP. The simple explanation or definition of the MRP as the difference between the return to risky assets (the market portfolio) and the return to riskless assets (government bonds or bills) belies the complexity of calculating the MRP and the underlying importance of the MRP in the CAPM formula.

In economics and finance literature, the MRP is also known as the 'equity premium'. Much of the literature on the equity premium has focused on the magnitude of the premium. Indeed, it is often referred to as the 'equity premium puzzle', because the level of the premium of equity over the risk-free rate is larger than can be explained by risk preferences. Mehra and Prescott first described the equity premium as a 'puzzle', in 1985.[59] They found the equity premium over the period 1889 to 1978 to average 6%. In 1996, Kocherlakota conducted an excellent survey of the equity premium puzzle literature and concluded that a resolution of the puzzle had not been found.[60] Recently, Mehra and Prescott reviewed the economics of the equity premium and confirmed their

[57] Given a debt to equity ratio of 60:40 this results in a 0.4% increase in the WACC.
[58] The ESC in its 2005 final decision electricity distribution provides a table listing MRP values for 20 regulatory decisions made in Australia between 2000 and 2005. Of the 20 decisions, 16 report 6% as the value for the MRP. The remaining four decisions were for a range for the MRP: three chose 5% to 6% and one chose 5.5% to 6.5%. ESC 2005c, *Electricity Distribution Price Review 2006–2010: Final Decision Volume 1, Statement of Purpose and Reasons*, October 2005, p. 365.
[59] Mehra R, Prescott E 1985, 'The Equity Premium: A Puzzle', *Journal of Monetary Economics*, no. 22, pp. 145–161.
[60] Kocherlakota N 1996, 'The Equity Premium: It's Still a Puzzle', *Journal of Economic Literature*, no. 35, pp. 42–71.

earlier view that the equity premium was a puzzle.[61] In attempting to explain the level of the equity premium, the literature has focused on relationships between the equity premium and other macroeconomic variables. The goal is to develop a theoretical model of equity prices that explains the premium and is consistent with empirical observations.

One of the consequences of the fact that economic theory cannot explain the magnitude of the equity premium is that the intuitive definition of the MRP given by participants in regulatory proceedings in Australia is often imprecise. For example, KPMG states in a submission prepared for Country Energy gas in 2003:

> The equity market risk premium ('MRP') represents the additional return over the risk-free rate of return that an investor would require as compensation for the risks of investing in a diversified equity portfolio. It is essentially a measure of investor's appetite for risk.[62]

This definition, which is similar to those found in many submissions, is subtly incorrect. As Mehra and Prescott state, economic theory predicts that if the equity premium compensated investors for risk only the value would be much smaller.[63] The correct intuition about the equity premium is based not on compensating for risk but on the expectation of future returns. If one takes the view that the best predictor of future returns is past returns, the equity premium represents equity investors' expectation of the return on the market portfolio above the return on risk-free assets. That is, it represents what equity investors expect to earn on a risky portfolio of assets in the future.

Given that economic theory cannot explain the magnitude of the equity premium, determining the magnitude of the equity premium becomes an empirical question. This exercise has generated an enormous number of research papers over the past two decades. The primary approach to estimating the equity premium has been to estimate the return on the market portfolio and subtract the return on risk-free assets. While this seems like a simple calculation, there are numerous complexities involved in providing an answer. These include how long a time period should be used for estimating the equity premium; whether to employ geometric or arithmetic averaging; which market instrument to use as the measure of the risk-free rate; and, fundamentally, how to measure the return to the market portfolio. The lack of a generally accepted approach to measuring the equity premium has resulted in estimates of the equity premium ranging from 3% to 8%.[64]

Another issue that has recently been raised is that there may be interrelationships between the various parameters that enter into the WACC calculation. In an economy that has dividend imputation, as is the case in Australia, there are three components to the return on the market portfolio: the capital return, the dividend return and the franking credit return. In a submission to the 2005 electricity distribution review in Victoria, SFG Consulting (SFG) present a detailed computational argument that purports to show that setting gamma to 0.5 and the MRP to 6% is logically inconsistent.[65] Further, they argue that the solution to returning internal consistency to

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[61] Mehra R, Prescott E 2003, 'The Equity Premium in Retrospect', in Constantinides GM, Harris M and Stulz R (eds), *The Handbook of the Economics of Finance*, Elsevier, Amsterdam.
[62] KPMG 2003, *The Appropriate Weighted Average Cost of Capital for the Regulated Gas Distribution Network: For Submission to IPART*, September 2003.
[63] Mehra, Prescott 1985.
[64] An article by Fama and French in 2002 reported estimates of the equity premium between 2.55% and 4.32% depending on the approach used to estimate the equity premium, while in the same year Dimson, Marsh and Staunton estimated the equity premium for Australia to be 7.6%. See Fama E, French K 2002, 'The Equity Premium', *Journal of Finance*, no. 57, pp. 637–659; and Dimson E, Marsh P, Staunton M 2002, *Triumph of the Optimist: 101 Years of Global Investment Returns*, Princeton University Press, Princeton.
[65] SFG Consulting 2005, *The Relationship between Franking Credits and the Market Risk Premium: The Implications for Regulatory Cost of Capital*, August 2005.

the model is to set gamma at zero if the MRP is to remain 6% or, if a gamma of 0.5 is to be maintained, to increase the MRP to 8.6%.[66]

Applying SFG's reasoning has significant effects on the level of the WACC. Using the Commission's 2004 price determination as an example, if gamma were set to zero and all of the other parameter values (including the MRP at 6%) were maintained, the resulting WACC would be 8.1% rather than the 7% the Commission granted. Increasing the MRP to 8.6% and holding all of the other parameters at their 2004 levels (including the gamma at 0.5) would also result in a WACC of 8.1%.[67]

SFG's model assumes that there is no uncertainty or risk and that the value of the business is based on the post-tax cash flows of the business that are either distributed as dividends or retained by the business. Thus the model is a series of accounting identities. These identities cannot explain the current observed levels of the MRP, as the observed levels of the MRP depend on trading in equity markets where prices are set in the presence of risk preferences and uncertainty. However, the computations in the SFG's report rely on observed levels of the MRP to generate their claimed inconsistencies.

One issue the SFG report highlights is that there may be interactions between the parameters in the WACC model that need to be taken into account when choosing values for individual parameters. This is certainly an area that needs more consideration.

The Commission opted for a value of 6% for the MRP in its 2004 water and wastewater price determination. In making this decision, the Commission considered the MRP levels chosen by other Australian regulators and the arguments brought forward by ACTEW regarding its claim that the MRP should be 6.5%.

[66] SFG 2005, pp. 20–21. It is not surprising that the two ways SFG claims will restore internal consistency to the WACC calculation result in the same value of the WACC. The theoretical model adopted by SFG is the Officer model, which is also the model used to derive the WACC formula.

[67] Increasing the WACC to 8.1% would have a significant effect on ACTEW's cash flows and the pocketbooks of consumers. Given a combined RAB of approximately $1,000 million this would result in about $10 million per year in additional revenue for ACTEW, which translates into approximately $75 per customer per year.

6 Summary

This discussion paper presents an overview of the processes regulators in Australia have adopted when determining the appropriate level of the WACC to apply in calculating the return on capital for a regulated business. Too often, the analysis has focused on the magnitude of an individual parameter or small number of parameters in the model. In making its assessment of the level of the WACC, the regulator needs to be mindful of the bigger picture, instead of purely focusing on the trade-off between the return granted to the regulated firm and the prices consumers ultimately pay for the regulated service.

In determining the rate of return, the Commission needs to ensure that the allowed return on capital is commensurate with the returns on investments of other firms with corresponding risks. The granted return on capital should be sufficient to guarantee the financial integrity of the business so as to maintain an acceptable level of creditworthiness. In addition, the level of the return on capital should not discourage the regulated business from making necessary investment in capital and replacement of outdated capital.

Even though this discussion of the calculation of the WACC involves mathematical models that appear to require objective precision, ultimately, regulators must balance a number of factors and determine the level of the WACC on the basis of judgement and experience.

7 Community involvement

The Commission is seeking comments from interested parties on the matters raised in this discussion paper and any other issues raised in this series of discussion papers.

To enable the Commission sufficient time to consider the submissions before releasing a working conclusions document in July 2007, the deadline for submissions is Friday, 15 June 2007.

Submissions, correspondence or other enquiries may be directed to the Commission at the following addresses:

The Independent Competition and Regulatory Commission

GPO Box 296
CANBERRA CITY ACT 2601

Level 2
12 Moore Street
CANBERRA CITY ACT

The secretariat may be contacted at the above addresses, by telephone on 6205 0799, or by fax on 6207 5887. The Commission's website is at www.icrc.act.gov.au and its email address is icrc@act.gov.au.

For further information on this investigation or any other matters of concern to the Commission please contact the Commission on 6205 0779.

Appendix Terms of reference

Australian Capital Territory

Independent Competition and Regulatory Commission (Regulated Water and Sewerage Services) Terms of Reference Determination 2007[68]

Disallowable instrument DI2007-65

made under the

Independent Competition and Regulatory Commission Act 1997 ('the Act'), Section 15 (Nature of industry references) and Section 16 (Terms of industry references)

Reference for investigation under s. 15:

Pursuant to subsection 15(1) of the Act, I refer to the Independent Competition and Regulatory Commission (the 'Commission') the matter of an investigation into, and the making of a price direction for, regulated water and sewerage services provided by ACTEW Corporation Limited ('ACTEW').

Specified requirements in relation to investigation under s. 16:

Pursuant to subsection 16(1) of the Act, I specify the following requirements in relation to the conduct of the investigation:

1. The territory intends to continue to impose a charge on ACTEW (currently the Water Abstraction Charge) to recover from ACTEW (and all other water takers) the costs associated with the taking of water and to reflect the value of water as a scarce resource.

2. The territory may set the charge referred to in paragraph 1 for the period 2008–09 to 2013–14 at a level or levels designed to:

   a. support the policies of the ACT Government, particularly as set out in the document entitled *Think Water, Act Water—Strategy for Sustainable Water Resource Management in the ACT*, and its target of a 'reduction in per capita consumption of mains water by 12 per cent by 2013 and 25 per cent by 2023'; and

   b. support such further reductions in water consumption as may be considered necessary or appropriate from time to time having regard to the impact of drought or other factors affecting the availability of water for supply in the territory.

   The setting of this charge will be in conjunction with other existing and possible future demand management policies of a non-price nature.

3. In making the price direction, the Commission is required to have regard to the charge referred to in paragraph 1 (as well as the possibility that the territory will change the level of the charge), the ACT Government policies referred to in paragraphs 2a and 2b, as well

[68] Name amended under Legislation Act, s. 60.

as ecologically sustainable development and National Water Initiative policies agreed to by the ACT Government.

4. In arriving at its decision on the price direction, the Commission should examine all regulatory models available to it under subsection 20A(1) of the Act, and report on the various costs and benefits to ACTEW, the territory and the community under each approach.

5. In arriving at its decisions in relation to the price direction, the Commission should have regard to:

   a. ACTEW's need to invest and sustainably maintain and manage its assets to maximise the security of the territory's water supply, particularly having regard to the current severe drought and the longer term impact of the damage to water catchments arising from the 2003 bushfires;

   b. the commercial value of past investment by ACTEW or its predecessor bodies in infrastructure that continues to deliver services and is needed to sustain a high standard of service to all residents of the territory, giving particular consideration to an optimised depreciated replacement cost valuation as applies in relation to other utilities;

   c. an assessment of the commercial value of ACTEW's regulatory asset base that gives particular consideration to all investment in the water network (including water and sewerage assets purchased or transferred from the Commonwealth in 1988 at the time of the creation of the ACT Electricity and Water Authority or otherwise gifted to it) and appropriately reflects the re-instatement of assets returned to service as the result of changes to operating procedures during the current period;

   d. an appropriate allowance for a cost of capital that ensures optimal incentives to invest and to manage the potential risks and costs to the community of under-funding, and under-investment in, infrastructure services;

   e. ACTEW's objectives under the *Territory-owned Corporations Act 1990* 'to operate at least as efficiently as any comparable business', 'to maximise the sustainable return to the Territory on its investment in the corporation…', 'to show a sense of social responsibility by having regard to the interests of the community in which it operates, and by trying to accommodate or encourage those interests' and 'to operate in accordance with the object of ecologically sustainable development';

   f. incentives for ACTEW to undertake commercial investment in research and development in water and sewerage services in the territory; and

   g. achieved efficiencies in service delivery and appropriate incentives to both ACTEW and the operator, currently ActewAGL, to ensure ongoing efficiencies.

6. In accordance with section 16(2)(a) of the Act, the Commission is to provide its final report by 1st March 2008.

Simon Corbell MLA
Attorney-General
February 2007

Glossary and abbreviations

ACCC	Australian Competition and Consumer Commission
ACG	Allen Consulting Group
ACT	Australian Capital Territory
ACTEW	ACTEW Corporation
CAPM	capital asset pricing model
Commission	Independent Competition and Regulatory Commission
CPI	consumer price index
ERA	Economic Regulation Authority (Western Australia)
ESC	Essential Services Commission (Victoria)
IPART	Independent Pricing and Regulatory Tribunal (New South Wales)
MRP	market risk premium
RAB	regulated asset base
RBA	Reserve Bank of Australia
SFG	SFG Consulting
WACC	weighted average cost of capital

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