QUEENSLAND COMPETITION AUTHORITY

Statement of Regulatory Pricing Principles for the Water Sector

December 2000

FOREWORD

The Principles

The Queensland Government recently amended the *Queensland Competition Authority Act 1997* to extend the responsibilities of the Queensland Competition Authority (the Authority) in respect of monopoly prices oversight and third party access in the water sector.

Against this background, the Premier and the Treasurer directed that the Authority outline the general pricing principles and related methods which the Authority considers relevant to the exercise of those responsibilities. Particular attention was required to those issues considered relevant to local government. The Authority was also required to develop principles relevant to the rural water sector.

As the range of pricing responsibilities of the Authority is very wide and will need to apply to many different physical and organisational circumstances, the pricing principles are expressed in general terms.

Broadly, the principles seek to address the concerns which lead to the need for monopoly prices oversight and third party access. That is, they are intended to reduce the possibility that some service providers may take advantage of their monopoly or near monopoly status by charging users of their services unfair prices, providing inappropriate services or quality of services or, restricting access to facilities which could be more effectively utilised for the community's benefit.

These pricing principles largely reflect outcomes associated with the operation of competitive markets but also seek to take account of a wide range of other public interest matters. Prices should be cost reflective, forward looking, ensure revenue adequacy, promote sustainable investment, ensure regulatory efficiency and take into account relevant public interest matters.

In most instances, a maximum revenue will need to be established for a regulated service provider, consisting of three "building blocks" - a return on capital, a return of capital and an appropriate estimate of efficient operating costs. Where specific prices will need to be set, the Authority considers that they should reflect the long run marginal cost of service provision. Where such prices do not achieve revenue adequacy, two-part tariffs will be appropriate for most water businesses. Under certain circumstances, a value for the water resource will need to be established. Usually incentive measures will also be required to promote efficiency over the regulatory period.

Disclaimer

In establishing the general principles, the Authority has sought to take into account the characteristics of water as a resource, developments in other regulatory jurisdictions, relevant Queensland Government policies and the statutory responsibilities of the Authority.

The general principles in this report address the broad issues identified as common to most instances where regulation can be anticipated. Effective application, however, requires attention to the particular circumstances of each case.

Changes in technology and institutional structure over time may alter regulatory objectives, and the relevant principles and associated regulatory methods. In discharging its responsibilities, the Authority is required to consider a wide range of public interest issues that may affect its recommendations or decisions.

Queensland Competition Authority
Level 19, 12 Creek Street *Tel: (07) 3222 0555*
GPO Box 2257 *Fax: (07) 3222 0599*
Brisbane QLD 4001 *Internet: www.qca.org.au*

The Authority therefore considers that the Pricing Principles should be viewed as a broad statement of regulatory intent to be applied with a discretion that reflects particular circumstances.

As a result, any particular approach cannot be considered to be definitive or binding on the Authority in a specific instance.

ACKNOWLEDGMENTS

The Authority wishes to acknowledge the assistance provided by a number of organisations and individuals in the preparation of the pricing principles.

Specialist research and consultancy services were provided by Marsden Jacob Associates, PricewaterhouseCoopers, Economic Insights, and Professor Harry Campbell of the University of Queensland. These research reports may be downloaded from the Authority's website at www.qca.org.au.

Various organisations also participated in reference groups convened by the Authority including Queensland Treasury, the Department of Natural Resources, the Queensland Water Reform Unit, the Queensland Audit Office, Queensland Treasury Corporation, the Department of Communication and Information, Local Government and Planning and Sport, the Local Government Association of Queensland, Brisbane City Council, and the Australian Industry Group.

TABLE OF CONTENTS

GLOSSARY

The following glossary is intended as a guide to the technical terms used in this report.

ACCC	Australian Competition and Consumer Commission
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
Aquifer	A geological formation of porous sub-surface material (such as sand, clay or rock) that traps water percolating from the Earth's surface and from which, depending on factors such as permeability and porosity, recoverable amounts of groundwater may be sourced
Asset consumption charge	See **Depreciation**
Building block approach	Generic approach to price/revenue regulation involving the determination of a maximum revenue requirement made up of a number of separate components, including a return on capital, asset consumption charge and operating, maintenance and administrative charges
Bulk water supplier	An entity involved in the supply of large quantities of treated or untreated water to water retail or distribution businesses
Bypass	The use of services other than those provided by the regulated network. For the water sector, bypass could include the construction of stand-alone distribution facilities from a bulk source, or on-site extraction
Capex	Capital expenditure
Capital structure	The mixture or ratio of debt to equity held by an entity (see **Gearing**)
CAPM	Capital Asset Pricing Model, used to estimate the expected return on a financial investment
ccf	One hundred cubic feet of water, a measure of water commonly used in the United States. One ccf is equivalent to approximately 2.8kL
COAG	Council of Australian Governments, consisting of the Prime Ministers, State Premiers, Territory Chief Ministers and the President of the Local Government Association
Commercialisation	The establishment of (State or local) Government owned commercialised business units as a means of undertaking a defined business activity
Constrained market pricing	Where prices are set within the band defined by stand-alone costs and incremental costs

CPI-X	A regulatory procedure under which a revenue or price cap (or some hybrid revenue/price constraint) is adjusted by the consumer price index (CPI), less an allowance for estimated efficiency gains (X) over the regulatory period
CSO	Community Service Obligation
Depreciation	A measure of the decline in an asset's service potential related to usage or technological obsolescence
Deprival value	Method of asset valuation which measures the loss that would be incurred if an entity were deprived of the future economic benefits from that asset, or the loss of service potential from that asset
DGM	Dividend Growth Model
DNR	Department of Natural Resources (Queensland)
DORC	Depreciated Optimised Replacement Cost, sometimes referred to as ODRC
EBIT	Earnings Before Interest and Tax
Economies of scale	Cost savings related to the use, management or production of goods or services in larger quantities, where average costs are declining over an increasing level of output
ECPR	Efficient Component Pricing Rule, or optimal input pricing rule. Access prices under ECPR are set taking into account the opportunity cost to the access provider of allowing access, including foregone revenue in related markets
EPA	Environmental Protection Authority (Queensland)
Equity beta (b_e)	A measure of undiversifiable market risk associated with an entity's assets and the financial risk borne by shareholders due to an entity's use of debt financing
Full cost pricing	An element of various competition reforms, where State or local government business activities are required to recover revenue sufficient to cover identified costs of delivering goods and services (for local governments full cost pricing also is a defined reform in its own right)
Gearing	The ratio of an entity's debt to its total capital (see also **Capital Structure**)
Groundwater	Water sourced from an underground aquifer
IPARC	Independent Pricing and Regulatory Commission of the Australian Capital Territory
IPART	Independent Pricing and Regulatory Tribunal of New South Wales
kL	Kilolitre, or one thousand litres (1000L)

Linear tariff	A tariff structure where revenue from users varies proportionately to use
LRMC	Long Run Marginal Cost, the cost of providing an additional unit when all production factors are variable
MAR	Market to Asset Ratio, or the ratio of the regulatory value of assets relative to their replacement cost
Market risk premium	The difference between the return on the equity market as a whole (r_m) and the risk free rate (r_f)
Maximum revenue requirement (MRR)	The total amount of revenue that an efficiently operated business would need to receive to remain commercially viable, but not earn monopoly profits. Generally derived using the building block approach
ML	Megalitre, or one million litres or one thousand kilolitres (1000kL)
NCC	National Competition Council
Nodal pricing	Where prices vary for defined sub-network areas reflecting identified cost differentials
Non-linear tariff	Tariff structure where revenue from users does not vary proportionately to use.
OECD	Organisation for Economic Co-operation and Development
Ofwat	Office of Water Services (United Kingdom)
Opex	Operating expenditure
Optimisation	The process of valuing an asset having regard to its optimal configuration, allowing for advances in technology, excess capacity and over-design
ORG	Office of the Regulator-General (Victoria)
Postage stamp tariffs	Usage charges that are uniform for all users (or classes of users) within a defined supply area, regardless of cost differentials
Reference tariffs	Benchmark tariffs for a defined 'Reference Service', commonly used in relation to gas and rail services
Regulated areas	Areas that benefit from artificial supplementation through storage infrastructure such as dams or weirs. Natural flows can be supplemented by releases from storages increasing reliability of supply
Regulatory asset base	The value of assets used for the purposes of determining the regulatory cost of capital, also referred to as the regulatory capital value or regulatory capital base

Renewals annuity	Where asset consumption charges are calculated as an annuity reflecting the costs of refurbishment/rehabilitation of the network as measured over a relatively long period of time
Risk free rate (r_f)	The return that accrues to securities with no risk. Returns on Commonwealth bonds commonly are used as a proxy for the risk free rate
SCARM	Standing Committee on Agriculture and Resource Management
Scheme	A water supply system based around a defined storage and/or distribution business activity, usually serving irrigation and other customers
Services	For third party access purposes a service refers to the use of a facility, such as a water pipeline. Services encompass the supply of goods, such as water itself
SRMC	Short Run Marginal Cost, or the cost of increasing production by one unit when at least one factor of production is held fixed
TER	Tax Equivalents Regime
TMP	Total Management Plan
Transferable Water Entitlements (TWEs)	Also Tradeable Water Entitlements. Water entitlements that can be traded separately from land. Under the Water Act 2000, water entitlements will have clear specification of ownership, volume and reliability and will be tradeable upon completion of a WAMP
TSLRIC	Total Service Long Run Incremental Cost, or the incremental costs incurred in providing a service in the long run, assuming all other productive activities are unchanged
Two part tariffs	Non-linear pricing structures, under which users face a fixed charge and a variable charge based on consumption
Unaccounted for water	That volume of water that is metered as having entered a particular network or system, but is not metered on withdrawal
Unbundling	The process of disaggregating prices to reflect the underlying values of individual services and/or commodities
Unregulated areas	Areas that do not benefit from supplementation of available water supplies by infrastructure such as dams and weirs
WACC	Weighted Average Cost of Capital
WAMP	Water Allocation Management Plan. A basin-wide planning process involving the identification of environmental flow objectives, water entitlements and development opportunities.

Water allocation	A generic term for water allocations of all types. A volumetric share of an allocatable water resource, usually expressed as a 'nominal allocation' or a 'maximum annual allocation'. See also Transferable Water Entitlement
Water harvesting	Water taken on an opportunistic basis usually from stream flood flows
WSAA	Water Services Association of Australia

1. EXECUTIVE SUMMARY

1.1 Background

The Authority has been directed to prepare a report on water pricing principles.

Disclaimer……

The Premier and the Treasurer ('the Ministers') directed the Queensland Competition Authority under section 10(e) of the *Queensland Competition Authority Act 1997* (the *QCA Act*) to update a previous confidential report on water pricing principles, and to address in particular water pricing issues for local governments. The Authority was also required to develop principles relevant to the rural water sector.

This Statement provides an outline of the general pricing principles and related methods the Authority considers relevant to its responsibilities. The nature of a particular issue and the relevant circumstances will determine the appropriate method to be applied.

Accordingly, any particular approach cannot be considered to be definitive or binding on the Authority in a specific instance.

1.2 Regulatory Responsibilities

The principles relate to the Authority's responsibilities in monopoly prices oversight, third party access and competitive neutrality.

Under the *QCA Act*, the Authority is required to monitor and report on the pricing practices of certain 'declared' monopoly or near monopoly State or local government significant business activities. For these businesses, the Authority's prices oversight responsibilities are recommendatory only, and the Authority may undertake an investigation only in response to a Ministerial reference.

The Authority also has prices oversight responsibilities for private sector water suppliers and for the South East Queensland Water Corporation Limited. For these businesses, the Authority may mediate a dispute but also has deterministic price setting powers, and may exercise these powers either pursuant to a Ministerial reference or in response to a water supply dispute.

All public and private sector water facilities, including local government water facilities, are potentially subject to the third party access provisions of the *QCA Act*. The Authority is empowered to arbitrate to resolve access disputes.

The Authority also has responsibility for the investigation of complaints, and the accreditation of compliance, of certain local government water business activities and the business activities of SunWater (previously State Water Projects of the Department of Natural Resources) in relation to competitive neutrality.

The Authority does not have a role in monopoly prices oversight of irrigation suppliers that are subject to price paths determined by Government.

Based on advice from relevant agencies, the Authority will not have a role in monopoly prices oversight of existing irrigation water suppliers where the Government has implemented price paths to move schemes to a minimum cost recovery position. However, there will be a role in monopoly prices oversight of new private sector irrigation supply businesses and possibly also for new public sector businesses.

1.3 Regulatory Objectives

Monopoly Prices Oversight

The objectives under the QCA Act guide the nature of the pricing principles.

The general objectives of the Authority follow from the requirements of the *QCA Act*. This requires the Authority to have regard to the protection of consumers from abuses of monopoly power, the promotion of competition, the efficient use of resources, and other relevant public interest concerns.

Public interest concerns are specifically noted in the *QCA Act* and include social welfare and equity implications, the impact on the environment, regional economic development, and workplace health and safety requirements.

Third Party Access

Third party access seeks to promote greater utilisation of essential infrastructure facilities, with a view to increasing competition in upstream or downstream markets and promoting more efficient outcomes. The *QCA Act* stipulates that third party access should:

- promote the efficient use of the infrastructure network;
- recognise the legitimate business interests of the access provider, including its commercial viability; and,
- be cognisant of relevant public interest considerations, including social and environmental implications and the benefits from promoting competition.

Third party access distinguishes itself from monopoly prices oversight in that it typically deals with the pricing of services from a segment of a network. It thus involves significant issues of cost allocation and only addresses costs related to infrastructure services (not the value of water). The terms and conditions relating to the basis on which access is to be provided also form a key element of third party access arrangements.

Competitive Neutrality

Competitive neutrality reforms seek to ensure that public sector businesses do not enjoy certain competitive advantages or disadvantages over actual or potential competitors.

Although competitive neutrality issues are not a primary consideration for this report, certain requirements relevant to each element of monopoly prices oversight and third party access (eg, relevant to asset valuation) are also generally consistent with the requirements of competitive neutrality.

1.4 Pricing Principles and Methods

Pricing Principles

The principles will need to apply to a wide range of circumstances and are therefore general.

The Authority's pricing responsibilities are potentially diverse in nature and will need to apply to a wide range of physical circumstances and organisational settings. In these circumstances, the pricing principles and the underlying methods are, of necessity, general.

The pricing principles…

To achieve the objectives of monopoly price regulation, including promoting economic efficiency, the Authority considers that prices of water delivered to an end user should:

- be cost reflective - that is, reflect the costs of providing the service and, usually where the demand for water exceeds its supply, potentially incorporate a value for the resource;
- be *forward looking* - in that they represent the least cost which would now be incurred in providing the requisite level of service over the relevant period;
- ensure revenue adequacy - the revenue needs of the business must be addressed where possible;
- promote *sustainable investment* - where the services are to be maintained into the future, the investor must be given the opportunity to enjoy an appropriate return on investment;
- ensure *regulatory efficiency* - the pricing method which minimises regulatory intrusion and compliance costs relevant to a particular circumstance should be adopted; and,
- take into account matters relevant to the *public interest*. Many such matters are identified in the *Queensland Competition Authority Act 1997*.

Further details of the issues that may be relevant to particular circumstances are outlined in the body of the Statement.

Methodology

Maximum Revenue Requirement

Setting a maximum revenue requirement provides the basis for most approaches to establishing prices.

In approaching individual situations, the Authority may be required, or consider it necessary to: assess particular pricing practices; establish a revenue constraint, price or revenue caps designed to constrain certain price behaviour, or, establish prices for specific services or customer groups.

However, the maximum revenue requirement usually provides the basis for most approaches. It consists of three "building blocks" including:

- an appropriate return on the capital necessarily invested in the business. This requires a determination of the appropriate value of investment in the business (the *regulatory asset base*) and the appropriate *rate of return* on that investment;

- a return *of* capital; and,

- the cost of operating the business in an efficient manner.

This approach is usually augmented with incentive regulation.

Regulatory Asset Base

Establishing the value of the regulatory asset base provides an initial step in estimating the "building blocks" underpinning the maximum revenue requirement.

To establish the appropriate amount of the return on capital, it is necessary to establish the regulatory asset base to which the return is to be applied.

The regulatory asset base is determined by:

- estimating the *deprival value* of the relevant assets - for monopoly prices oversight this is likely in most cases to result in the regulatory asset base being valued according to the depreciated optimised replacement cost method;

- *optimisation* of the asset network as part of the valuation process. At a minimum, entities should specifically account for unplanned excess capacity and ensure that fully redundant assets are removed from the regulatory asset base;

- adjusting the regulatory asset base to account for forecast (reasonable) *capital expenditure*, with such adjustments generally effected in the period in which the new investment is brought into use; and,

- recognition of *capital contributions* where warranted. This is best achieved by including user funded or contributed assets in the regulatory asset base, and establishing an offsetting arrangement with the contributor or users. In the absence of a specific agreement or agreed purpose, the treatment of capital subsidies and grants from Government should be at the asset owner's discretion.

The three "building blocks" consist of….

In considering the appropriate asset base for pricing purposes, the Authority will need to give consideration to the differences between the urban/industrial and irrigation sectors resulting from the impact of government pricing policies, capital contributions and subsidies, and the quality of the service.

Return on Capital

Once the regulatory asset base is established, an appropriate return on capital needs to be estimated which should reflect the level of risk in the relevant business activity:

…the return on capital

- the *weighted average cost of capital* approach is generally considered to be the most appropriate method of estimating the cost of capital for contemporary monopoly regulation;
- for the purposes of estimating the weighted average cost of capital the Authority would establish a *capital structure* suitable to the individual characteristics of the regulated business;
- the *return on debt* would reflect the cost of debt for the water sector though taking into account differences in the levels of gearing considered appropriate to the entity; and,
- the *return on equity* would be estimated using the Capital Asset Pricing Model (CAPM).

Return of Capital

The Authority considers that:

….the return of capital

- where demand warrants continued service provision, the return of capital should be set to provide a cash flow sufficient to *maintain the service potential* of the relevant water asset/network;
- a *range of methods*, including forms of cost-based depreciation or renewals annuity approaches, would be considered provided these can be demonstrated to meet the above objective;
- where *renewals annuities* are adopted, an asset management plan should be established by the relevant business activity to promote transparency, and a planning period adopted consistent with commercial principles (usually in the order of 20 to 30 years).

Operating Costs

Operating costs of any regulated business must:

…an appropriate estimate of the operating costs.

- represent efficient service delivery given the scale of operation and nature of the activity being undertaken;
- be evaluated on an individual basis, and usually this would include benchmarking against other relevant organisations.

For irrigation schemes, operating costs should be based on efficient costs where these can be practically determined, but may need to be ‘averaged’ to reflect ‘normal’ year costs.

Cost allocations should reflect differences in the specification of products supplied to customer groups, for example, supply reliability.

Two Part Tariffs

Where prices need to be set, they should reflect the long run marginal cost. In most circumstances two-part tariffs will provide the most appropriate approach.

In some circumstances, specific prices will need to be established. These should be based on long run marginal costs. However, where such prices do not achieve revenue adequacy:

- *two part tariffs* will best meet the objectives of efficient pricing, cost recovery and equity for most urban water businesses;
- *volumetric charges* in a two-part tariff generally should be set to reflect the long run marginal cost (LRMC). In practice this would involve the estimation of an average incremental cost;
- the *fixed component* of a two part tariff should be set to recover any revenue shortfall (after the application of volumetric charges), and structured so as not to encourage bypass or disconnection from the network;
- *in the irrigation sector,* it is likely that two-part tariffs will need to be adjusted to reflect water supply risk and environmental variables;
- *postage stamp tariffs* may be appropriate in some circumstances, but where costs of supply differ substantially between areas or consumer classes, efficiency would be enhanced where prices reflect the underlying cost differentials. The administrative efficiency and social impact of such a change would also need to be considered;
- *seasonal pricing options and nodal pricing* can lead to efficient outcomes. These pricing options may be more readily applied to the irrigation sector because of the relatively small number of customers*;* and
- *CSOs* relevant to water businesses generally should be costed using the avoidable cost method.

Pricing Water

In some circumstances, the price of water, as distinct from the cost of infrastructure services, will need to be estimated.

Delivered water prices effectively represent (at least) two separate components – a price for the infrastructure services associated with its treatment, transmission and distribution and the cost of the resource itself.

- where there exists unmet demand as a result of either hydrological or infrastructure constraints a value may need to be ascribed to the water resource. This is often referred to as the scarcity value;
- this scarcity value may be estimated by reference to prices in a relevant *competitive market* for water property rights or by other means; and
- in establishing the scarcity value, the reason for the supply constraint will need to be ascertained, that is, whether it is

due to infrastructure or hydrological constraints.

Regulatory Incentives

The maximum revenue requirement will need to be augmented by measures designed to ensure ongoing efficiency.

Incentive measures are a key element of any effective regulatory regime. Appropriately constructed and applied incentive regulation can encourage efficiency improvements and ensure that, over the longer term, consumers and the regulated business are better off. The Authority's general approach is that:

- consistent with current regulatory practice, *CPI-X* price or revenue adjustments should be adopted during the regulatory period;
- gains through out-performance of regulatory benchmarks should generally be passed through to consumers using a (full) *glide-path*, or through a once-off adjustment at the commencement of the subsequent regulatory period;
- *unforeseen changes* in the business' operating environment (such as changes in taxes or increased statutory quality requirements) should be accommodated by defining relevant trigger events and appropriate cost pass-through arrangements;
- different *quality or customer standards* should be recognised in regulatory determinations;
- *regulatory periods* of 3-5 years should be adopted initially to provide greater incentives for efficiency improvements and for realisation of longer-term objectives.

2. BACKGROUND

2.1 Introduction

The Authority is a statutory body with functions relating to the application of competition reforms.

The Queensland Competition Authority (the Authority) is a statutory body established under the *QCA Act*. The *QCA Act* gives the Authority certain responsibilities and functions with respect to the application of competition reforms in Queensland. Broadly, these include:

- undertaking prices oversight of monopoly or near monopoly Government business activities (subject to declaration by the Ministers);
- receiving and investigating competitive neutrality complaints against significant government and local government business activities;
- overseeing and arbitrating third party access to infrastructure; and
- undertaking such other activities relating to the application of competition reform as the Ministers may direct. As a result of a Ministerial Directive, the Authority is currently responsible for the oversight of local government compliance with the Council of Australian Governments' (COAG) strategic water reform framework as part of the Local Government Financial Incentive Payments Scheme.

2.2 Direction

The Authority has been directed to prepare a report on water pricing principles.

On 14 April 1999, the Ministers directed the Authority under section 10(e) of the *QCA Act* to undertake work in relation to regulatory pricing principles for the water sector. The direction specifically requires the Authority to:

(a) update, where necessary, its initial report on water pricing principles and address in the report water pricing issues for local government;

(b) conduct a consultation process to communicate and refine, where necessary, the principles and methods in the report; and

(c) develop, with the Department of the Premier and Cabinet and Queensland Treasury, the appropriate timing, staging and scope of the report.

The initial report referred to in (a) relates to a previous confidential report prepared for Ministers.

In respect of the requirements of part (c) of the direction, a Project Brief was developed and agreed with both the Department of the Premier and Cabinet and Queensland Treasury. The Brief required the Authority to focus specifically on pricing principles

relevant to monopoly prices oversight and third party access in the urban water sector. Consistency with competitive neutrality pricing requirements also was to be addressed. A further request was made to incorporate principles for water pricing relevant to the rural sector.

2.3 Statement of Regulatory Pricing Principles

Purpose

The pricing principles relate to the Authority's responsibilities in monopoly prices oversight, third party access and competitive neutrality.

This report responds to the Ministers' direction, as it relates to both the urban and rural water sectors. It details the pricing principles the Authority envisages it would apply in the exercise of its regulatory responsibilities relating to prices oversight of monopoly or near monopoly water supply business activities, third party access to 'declared' water services, and competitive neutrality. As a result the pricing principles are therefore also relevant to local governments in seeking to achieve compliance with the requirements of the Local Government Financial Incentive Payments Scheme.

In establishing the pricing principles for the water sector, the Authority has sought to distinguish between the regulatory objectives associated with each of its responsibilities, the pricing principles necessary to achieve those objectives, and to provide an outline of methods consistent with such objectives and principles. Such an approach was required for the initial report to Government.

There are many issues common to both pricing and financial reporting/accounting. The focus of this report is on pricing, and it does not specifically address issues of consistency with financial reporting requirements.

2.4 Structure of the Report

The report structure…

Chapter 3 reviews the water sector in Queensland, its physical and economic characteristics and the rationale underpinning regulatory mechanisms such as monopoly prices oversight and third party access.

Chapter 4 discusses the Authority's regulatory responsibilities, and specifically the functions of monopoly prices oversight, third party access and competitive neutrality.

Chapter 5 outlines general approaches to monopoly price regulation, and how these are applied in the context of the Australian water sector. This Chapter then develops the Authority's preferred approach to monopoly prices oversight and third party access for water services.

Chapter 6 provides a detailed discussion on the maximum revenue requirement concept that underpins the majority of the Authority's urban water pricing principles. Key issues include the determination and valuation of the regulatory asset base, establishing a rate of return, asset consumption charges and

operating and maintenance costs for regulatory pricing purposes.

Chapter 7 provides further discussion on specific pricing principles, including the appropriate components of a two part tariff for water services and the pricing of water separate from the services related to its harvesting and delivery. This Chapter also addresses issues such as postage stamp tariffs and cross subsidies.

Chapter 8 deals with incentive regulation and aspects of the proposed pricing arrangements relevant to creating the right incentives for the delivery of cost effective services and for continued innovation and operational improvements over time. This Chapter also highlights some of the consequential implications for water businesses, identifying the key issues for water businesses to respond effectively and successfully to the proposed regulatory arrangements.

Chapter 9 provides an overview of the issues relevant to the application of the general principles to the rural water sector. These relate mainly to asset valuations, the implications of tradeable water entitlements and the structure of water charges.

Appendix A outlines alternative approaches to the estimation of the cost of equity and Appendix B deals with other issues in the quantification of a rate of return for regulatory purposes. These Appendices should be read in conjunction with the related discussion in Chapter 6. Appendix C discusses some of the issues relevant to the application of third party access to the water sector, and provides further information to that in Chapter 5.

3. THE WATER SECTOR AND MONOPOLY REGULATION

3.1 The Provision of Water

There are costs incurred in harvesting, storing, treating and distributing water services.

In many communities, water has traditionally been regarded as an essential commodity and provided without reference to the costs associated with its delivery or use. In some areas this has resulted in excess use, over-investment in infrastructure or environmental degradation.

The provision of water involves investment in infrastructure designed to harvest, store, treat and deliver water. Water itself is a resource and there are costs associated with diverting it from other uses to meet the requirements of domestic, commercial and industrial users, or particular groups within these categories.

The demand for water is determined by the needs, preferences and practices of consumers and industries within a particular region, as well as the need to maintain sustainable environmental systems. The supply of water is governed by the hydrological cycle, the availability of groundwater and the availability of infrastructure to harvest and distribute water to consumers and users.

3.2 The Urban Water Sector

Urban water services include generation, transmission, distribution and retail services.

Urban Water Services

The urban water sector includes services relevant to:

- *generation* – including the harvesting and collection of water, bulk storage, treatment and pumping;
- *transmission* – including the bulk transmission of raw and treated water using large diameter pipelines, with associated pumping facilities, to localised storages or treatment works;
- *distribution* – including the reticulation of water from bulk mains to users through a network of medium to small diameter pipelines; and
- *retail* – including supply to individual customers, plus ancillary services such as metering and billing (adapted from Tasman Asia Pacific 1997).

The urban water sector is typically considered to include other services such as sewerage and waste-water, water re-use, engineering and other activities. However, this report focuses on pricing principles for water supply activities only.

Urban Water Service Providers

Urban providers include local governments and water boards.

Urban water providers range from large, vertically integrated utilities, to smaller geographically dispersed distribution/retail businesses. They include:

- local government water businesses;
- bulk water suppliers, including the South East Queensland Water Corporation, Gladstone Area Water Board, Townsville-Thuringowa Water Supply Board and the Mount Isa Water Board; and
- joint local government water boards, including the Caloundra-Maroochy Water Supply Board and the Esk, Gatton and Laidley Water Supply Board.

There also are a large number of smaller urban water supply schemes run by statutory water boards and Aboriginal and Torres Strait Islander Community Councils.

Industry Characteristics

Capital investment in water supply infrastructure is typically lumpy and features declining average costs.

In Queensland, urban water supplies are predominantly sourced from dams or storage reservoirs, or directly from rivers or groundwater sources. Some local government water services businesses own and manage major headworks as well as distribution networks, while others obtain treated or untreated bulk water from urban water boards, joint local government water boards or from SunWater.

Jointly, these entities control water assets valued at more than $18.5 billion (Fitzgerald et al 1996) with the urban water sector accounting for approximately 15-20 per cent of the State's total water consumption (Dayananda and Smith 1997, Department of Natural Resources 1999).

There also is an emerging potential for private sector entities to provide urban water services.

Domestic or household users account for a substantial proportion of total urban water usage. Domestic usage in Brisbane, for example, accounts for 70 per cent of total water consumption. (WSAA 1998).

Capital investments are large and occur in discrete "lumps", particularly for network extensions or supply augmentations. Investments in water storages and transmission and reticulation facilities are largely "sunk". That is, they cannot be recovered (except through ongoing commercial use) or put to alternative uses. Water transmission and distribution networks are typically not linked between catchments, and often demonstrate declining average costs as the quantity supplied increases.

As a result of the high investment costs, lumpiness in capital investment, and declining costs over relevant supply ranges,

duplication of facilities and networks is generally not economically feasible. Together with the absence of links between networks, these factors indicate that competition between urban water supply businesses is not readily attainable.

3.3 The Rural Water Sector

There are five categories of rural water businesses.

Rural water services account for the majority of water (80%) supplied through regulated and unregulated systems in Queensland each year. Rural water suppliers fall into five categories:

- SunWater (formerly State Water Projects);
- rural water boards, including the North and South Burdekin Water Boards, Pioneer Valley Water Board, and numerous smaller water boards;
- potential future private sector rural water suppliers;
- unregulated surface water and groundwater supplies under the stewardship of the Department of Natural Resources (DNR); and,
- other suppliers, such as Rockhampton City Council, Dumaresq Barwon Border Rivers Commission, and other storage and pipeline owners that provide stock and domestic supplies.

SunWater is the dominant rural water supplier.

SunWater is the dominant rural supplier, directly meeting the needs of irrigators and regional industry (mostly electricity and mining customers) as well as providing bulk water supplies to regional urban centres and many of the rural water boards.

SunWater is a government owned corporation under the *Government Owned Corporations Act 1993* while the rural water boards are constituted under the *Water Act 2000*. Individual schemes within SunWater operate as discrete units, and have different supply characteristics – water supply reliability, industry base, customer numbers, and infrastructure types. The major irrigation industries are sugar-cane, cotton, dairying and horticultural crops.

SunWater provides different water products according to customer needs.

SunWater provides different water products to its customers. Urban and industrial customers receive a high reliability product and meet commercial charges by agreement or contractual arrangement (there are some exceptions due to historical arrangements). Irrigators typically receive a medium reliability water supply with announced allocations being determined as a percentage of nominal allocations each year. The high reliability urban and industrial supply incurs higher storage costs while, in times of shortage, irrigation announced allocations may be reduced. Some irrigators, typically those with tree or vine crops, also hold high reliability allocations.

Rural water boards primarily serve irrigation customers.

The rural water supply boards do not manage major storages. Most are customers of SunWater, manage distribution systems and have a primarily irrigation customer base. There are currently no private sector water suppliers, but the *Water Act 2000* provides a legislative basis for these to be established in the future.

Unregulated water resources are managed by the Department of Natural Resources.

Unregulated water resources are those not supplemented by dams or other forms of storage infrastructure. Likewise, unregulated groundwater resources are not supplemented by recharge works. Apart from nominal licence fees, there are no charges for the use of unregulated water. These resources are managed and monitored by the Department of Natural Resources (DNR).

DNR also administers declared groundwater management areas and water harvesting services in regulated areas for which nominal usage charges are made, to cover the costs of monitoring studies, metering and management. In some cases, SunWater purchases flood harvested flows for sale to its customers.

Demand for irrigation water is a derived demand, dependent on external factors.

A key difference between irrigation water demand and urban water demand is that the demand for irrigation water is a derived demand. That is, demand for irrigation water depends on changes in commodity prices and on-farm costs. Because most irrigation commodity markets are traded on volatile world markets, the demand for water can be extremely variable, even within seasons. Rainfall conditions exacerbate this variability as irrigation is a supplementary water source.

Regional urban and industrial demand is usually relatively stable, particularly that of power stations and mining companies.

3.4 Rationale for Economic Regulation

Regulatory oversight is required to ensure that monopoly water suppliers do not over-price water services or fail to meet service quality standards.

With the presence of monopoly characteristics in the delivery of water infrastructure services as identified above, suppliers potentially enjoy market power. Such monopoly or near-monopoly suppliers may restrict services, increase prices, lower quantities of water available for sale or provide a lower standard of service or product quality, without the threat of competitive sanction.

Over-pricing may result from efforts to maximise profits, or from charges being based on unnecessary costs. Revenue derived may be dissipated in the form of excess rewards to owners or employees, or through the "gold plating" of infrastructure.

Problems also may arise when owners of certain "essential" infrastructure facilities are in a position to inhibit or distort competition in upstream or downstream markets. Where they are vertically integrated, the owners of such facilities may have incentives to restrict competitors' access to the facilities' services, or to offer discriminatory terms and conditions of access.

In the absence of structural reforms that encourage the establishment of competitive markets, or competition for

particular markets, regulators generally are required to oversight prices set by monopoly and near monopoly suppliers and to ensure the provision of adequate standards of service.

To promote the efficient utilisation of essential infrastructure assets, it is common to provide a right of access by third parties to such infrastructure to encourage competition in upstream or downstream markets. Regulators then may be required to ensure that access is provided on reasonable terms.

In exercising these responsibilities, regulators frequently are required to take into consideration broader economic and social factors. In the case of the urban water sector, key issues typically relate to consumers' ability to pay, environmental requirements, health and pollution, and visual and recreational amenity.

3.5 Regulatory Response

The Queensland Government is committed to the COAG reforms including consumption based charging and two-part tariffs.

The Council of Australian Governments' (COAG) has responded to the issues confronting the water sector through the 1994 Water Resources Policy which seeks to establish a strategic framework for the efficient and sustainable reform of the Australian water industry.

In respect of pricing, the COAG policy requires urban water service providers (where they are publicly owned) to adopt pricing regimes based on the principles of consumption-based pricing, full cost recovery and the removal of cross-subsidies. Urban water providers are to apply two part tariffs comprising a connection charge and a usage charge, where this is cost effective. Metropolitan bulk suppliers must charge on a volumetric basis to recover all costs and earn a positive real rate of return on the written down replacement value of their assets.

The Queensland Government has undertaken to reform the water industry through a series of consistent initiatives, including:

- a commitment to the National Competition Policy which requires implementation of the 1994 COAG Water Resources Policy;

- requiring larger local governments to implement, amongst other things, structural reform, consumption based pricing and two part tariffs in respect of their water businesses to qualify for financial incentive payments;

3.6 Other Regulatory Objectives

Regulatory intervention should be low cost, accountable and involve stakeholders.

Regulatory intervention does not occur without some risk of regulatory failure. As a result, a general preference exists for facilitating commercial agreements and solutions by the parties involved, or other forms of 'light-handed' regulation.

Where regulatory intervention is required, additional objectives include:

- simplicity and low regulatory compliance costs;
- accountability and transparency of the process to promote consistency, and to allow for ready verification of compliance; and
- involvement of stakeholders to ensure comprehensiveness.

4. THE AUTHORITY'S REGULATORY RESPONSIBILITIES

4.1 Monopoly Prices Oversight

Government Monopoly Business Activities

The Authority is required to investigate pricing practices of declared government monopoly business activities at the Ministers' direction.

Under the *QCA Act*, the Authority is required to monitor and report on the pricing practices of certain monopoly or near monopoly business activities of State and local governments. In its reports the Authority must include recommendations about the pricing practices of the business and the reasons for these recommendations.

A business activity may be declared a government monopoly business activity for the purposes of prices oversight either by regulation or by Ministerial declaration. Investigations into the pricing practices of a declared government monopoly business activity may be initiated in response to a reference from the Ministers, or under a standing reference where the initial declaration was made under regulation.

The Authority must have regard to a number of economic, social and environmental matters.

Section 26 of the *QCA Act* sets out the matters the Authority must have regard to in conducting an investigation. These include, but are not limited to:

- the need for efficient resource allocation;
- the need to promote competition;
- the protection of consumers from abuses of monopoly power;
- the costs of providing the relevant goods or services, having regard to relevant interstate and international benchmarks;
- the actual costs of providing the relevant goods or services, and the quality, reliability and safety of these;
- the appropriate rate of return on government assets;
- the effects of inflation;
- the impact on the environment;
- considerations of demand management;
- social welfare and equity considerations, including community service obligations;
- the need for pricing practices to not discourage socially desirable investment or innovation;

- legislation or government policies relating to occupational health and safety and industrial relations;
- economic and regional development issues; and,
- any directions given by the relevant government agency.

The Authority makes recommendations on the pricing practices that it considers appropriate for a declared entity. Responsibility for setting prices rests with the State or relevant local government.

The Authority has been advised by relevant Government agencies that it will not initially have a monopoly prices oversight role for irrigation sector pricing in existing rural water supply schemes operated by SunWater. These users are subject to a Government-determined price path designed to achieve a minimum cost recovery position. The Authority will have a prices oversight role for other irrigation water suppliers including future new developments.

Prices Oversight for Private Water Suppliers

The prices oversight roles of the Authority have been extended to include private sector water suppliers.

The Queensland Government recently extended the Authority's prices oversight jurisdiction to include private sector water businesses and also the newly-formed South East Queensland Water Corporation Limited.

The Authority has developed criteria to be used by the Ministers to determine whether a candidate water supply activity[1] should be declared a monopoly water supply activity. The Ministers may make this declaration on their own initiative or pursuant to a request by the Authority.

The Authority has deterministic powers on matters relating to the supply and pricing of water by private sector water suppliers.

Once declared a monopoly water supply activity, the business would be subject to broadly the same investigation process that applies to State and local government monopoly businesses. However, the Authority would be able to make a binding water supply determination rather than simply making recommendations on appropriate prices or pricing practices. Water supply determinations may cover any matter relating to the pricing of water, and may include a requirement that water prices are derived according to a particular method.

Even where not declared by Ministers to be a monopoly water supply activity, the Authority would be able to mediate and, if necessary, arbitrate any dispute between a party seeking water supply and a water supplier provided the supplier is considered to be in a position to exercise market power.

The Authority also would be able to consider water supply

[1] A water supply activity must be declared by regulation to be a candidate water supply activity. There currently are no declared candidate water supply activities. The making of a regulation would be subject to normal legislative requirements and the Government would be required to prepare a Regulatory Impact Statement and consult with key stakeholders regarding the potential impacts of the regulatory declaration.

undertakings from water suppliers (including the South East Queensland Water Corporation). An undertaking provides a means whereby a business activity is able to seek the Authority's endorsement of a pricing structure or other terms and conditions relating to the supply of water. These undertakings, if approved, would form the basis for resolution of any water supply disputes.

Under this regulatory framework for prices oversight, the Authority potentially may be required to arbitrate on the price of a water allocation or part thereof, separate from any associated infrastructure-related service (such as transmission or treatment).

Prices Oversight of the Rural Sector

The Authority's responsibilities in monopoly prices oversight differ for the irrigation sector.

The Authority's responsibilities in relation to monopoly prices oversight are the same for urban water businesses and rural water businesses with the exception of the irrigation sector.

Queensland's irrigation sector has largely developed on the basis that water use charges covered only operating and maintenance costs. For many schemes, charges fall short of covering even the essential operating and maintenance costs.

In recognition of the historical setting of regional development, COAG established what is referred to as the 'lower bound' as a minimum cost recovery requirement for water businesses supplying the irrigation sector. Lower bound costs include all operational, maintenance and administration costs, provision for asset refurbishment or replacement (depreciation or renewals), taxes or tax equivalents, interest on actual debt, dividends (if any) and externalities. COAG guidelines define externalities to mean environmental and natural resource management costs attributable to, and incurred by, water businesses (eg as a result of salinity). There is no requirement for a return on equity.

The Government has implemented cost recovery price paths for SunWater irrigation schemes.

Most of Queensland's irrigation scheme charges fall short of the lower bound, but a small number of SunWater's schemes do provide a nominal return on capital. The Government has implemented price paths[2] to move irrigation schemes operated by SunWater to the lower bound cost recovery level by direction under Section 1120 of the *Water Act 2000*. The price paths apply to the irrigation sector only, and not to the urban and industrial customers of non-urban schemes.

The Authority does not have a prices oversight role for irrigation pricing in SunWater schemes where price paths are in place.

The Authority has been advised by relevant Government agencies that it will not have a monopoly prices oversight role for irrigation sector pricing in existing SunWater irrigation schemes during the period for which the price paths are in effect.

However, the Authority will have a responsibility for monopoly prices oversight of all business activities of rural water suppliers that are not covered under the Government's price paths. These include other irrigation service providers such as the rural water boards as well as pricing for urban and industrial sectors serviced

[2] The price paths cover the 5-year period 2000 to 2004 inclusive. For a small number of irrigation schemes, the Government has established 6-year or 7-year price paths, through to 2005 or 2006.

within irrigation schemes where such facilities are declared for oversight by the Queensland Government. Irrigation services not covered by the price paths such as water harvesting will also be potentially subject to prices oversight by the Authority.

The Authority has prices oversight responsibilities for new irrigation schemes.

The Authority will also have a role in monopoly prices oversight of pricing for all user sectors in new irrigation schemes developed by private sector water suppliers. It will also have responsibilities in monopoly prices oversight of new irrigation schemes or expansions of existing schemes developed by government water supply businesses if these are declared for prices oversight by the Queensland Government.

4.2 Third Party Access

Current Responsibilities

The Authority has responsibilities in accepting undertakings and arbitrating disputes on third party access to declared water services.

Third party access provides potential competitors with a legislative right to negotiate access to services provided by essential infrastructure facilities. The *QCA Act* established a State-based third party access regime[3] that requires the Authority to:

- assess whether services ought to be declared for third party access;
- accept (or refuse to accept) access 'undertakings' in respect of declared services; and
- arbitrate third party access disputes.

Services may be declared by gazette notice (Ministerial declaration) or by regulation. The *QCA Act* sets out criteria that the Ministers must be satisfied are met for declaring a service for third party access, namely:

- that access (or increased access) to the service would promote competition in at least one market, whether or not in Australia, other than the market for the service;
- that it would be uneconomical to duplicate the facility for the service;
- that access (or increased access) to the service can be provided safely; and,
- that access (or increased access) to the service would not be

[3] The *QCA Act* has not yet been certified as an 'effective' State-based access regime by the National Competition Council (NCC). This does not preclude access arrangements being struck under this legislation, but does mean that a party could seek to have a Queensland water service declared under the national third party access regime (through the NCC). The national access regime is broadly similar to that in the *QCA Act*, although it includes the additional criterion of 'national significance' that must be satisfied in order for the facility to be declared for access purposes.

contrary to the public interest.

Matters relevant to considering the public interest are set out in s76(3) and are similar to those of s26 summarised above in respect of monopoly prices oversight.

Local government water facilities are considered 'existing private' facilities, and accordingly may only be declared by the Ministers having regard to the threshold criteria considered above, and after having been declared by regulation to be a 'candidate service'.

Declaration of a service provides an access seeker with a legislative right to negotiate with the access provider with a view to making an access agreement for any 'spare capacity'. Mediation and/or binding arbitration may be undertaken by the Authority in the event of a dispute between the parties. The primary focus is on the parties reaching a commercial settlement, independent of regulatory intervention.

The Authority must have regard to economic and financial matters and the public interest.

Section 120 of the *QCA Act* details the criteria the Authority must have regard to in arbitrating disputes and in making an access 'determination', including:

- the access provider's legitimate business interests and investment in the facility;
- the legitimate business interests of persons who have, or may acquire, rights to the service;
- the public interest, including the benefit to the public of having competitive markets;
- the value of the service to the access seeker or a class of access seekers or users;
- the direct costs to the access provider of providing access to the service, including any costs of extending the facility, but not costs associated with losses arising from increased competition;
- the economic value to the access provider of any extensions to, or other additional investment in, the facility that the access provider or access seeker has undertaken or agreed to undertake;
- the quality of the service;
- the operational and technical requirements necessary for the safe and reliable operation of the facility; and
- the economically efficient operation of the facility.

The Authority may also consider (and accept or reject) access

'undertakings' put forward by facility owners. Undertakings allow the facility owner to determine certain benchmarks or terms and conditions upon which access to services will be granted.

Water services subject to third party access could include storages, pipelines and treatment facilities.

Third party access deals with access to a specific service provided by an infrastructure facility. Potential third party access candidates for water services include major storages, transmission pipelines and water treatment facilities (to the extent that these are integral to the service to which access is being sought). Third party access does not extend to access to water allocations, nor to regulation of the prices that may be charged for the sale of water allocations, as these are not considered services under the *QCA Act*. At the time of writing no water facilities have been declared for third party access.

4.3 Competitive Neutrality

The Authority's Regulatory Responsibilities

The Authority has responsibilities in investigating competitive neutrality complaints.

The Authority's competitive neutrality responsibilities include:

- investigating complaints that State-owned significant business activities or certain local government owned business activities[4] are not complying with the relevant principles of competitive neutrality. The results of any investigations are reported to the relevant Ministers or local government for action; and

- accrediting State and local government business activities as complying with the principle of competitive neutrality. Where granted, an accreditation provides 'protection' from competitive neutrality complaints for a period of up to two years.

For the purposes of competitive neutrality, State and local governments are regulated under different legislation. State government water business activities need to be declared under the *QCA Act* before being subject to the Authority's jurisdiction. Following recent amendments, the *QCA Act* defines the principle of competitive neutrality as requiring that:

> "a government agency carrying on a significant business activity should not enjoy a competitive advantage over competitors or potential competitors in a particular market solely because the agency's activities are not subject to 1 or more of the following:
>
> - full Commonwealth or State taxes or tax equivalent systems;

[4] The Authority may only consider competitive neutrality complaints against significant local government business activities (type 1 or type 2 businesses) or competitive roads businesses (type 3) where the relevant local government has nominated the Authority as its competitive neutrality referee. Local governments may elect to establish an alternative (internal) complaints process for these business activities, although complainants may appeal any subsequent decisions of the referee to the Authority in some circumstances. For all other local government business activities to which competition reforms are applied, an alternative (internal) complaints mechanism is required.

- debt guarantee fees directed towards offsetting the competitive advantage of government guarantees;

- procedural or regulatory requirements of the Commonwealth, the State or local government on conditions to which a competitor or potential competitor may be subject, including, for example, requirements about the protection of the environment and about planning and approval processes."

The Authority can only investigate matters consistent with these requirements unless specifically directed by the Premier and the Treasurer to investigate other matters which may affect competition between a government business entity and a private business.

Local Government's significant urban water business activities are subject to the *Local Government Act 1993* and are required to ensure that public sector businesses are not competitively advantaged or disadvantaged simply by virtue of their government ownership or control.

Competitive Neutrality and Urban Water Businesses

None of the State-owned urban water boards have yet been declared.

None of the State-owned urban water boards have been declared for the purposes of applying competitive neutrality requirements, although it is understood that competitive neutrality requirements are to be applied as part of the process of commercialisation of these entities.

For local government water businesses, 35 have elected to apply some level of competition reform, ranging from commercialisation to the code of competitive conduct.[5] Each of these business activities is required to comply with legislative competitive neutrality requirements, of which full cost pricing is an integral component (see *Local Government Act 1993*).

The Authority has a role in assessing the implementation of competitive neutrality reforms by local governments.

The pricing principles in this report are relevant to the implementation of competitive neutrality reforms, and to the Authority's assessment of reform implementation under the Local Government Financial Incentive Payments Scheme.[6] A key principle is adherence to full cost pricing, that is, projected total revenue of a business activity must be sufficient to cover projected total costs, including operational costs, administration and overhead costs, depreciation, tax equivalents, externalities and a return on capital.

The *Local Government Finance Standard 1994* provides further guidance on the derivation of these cost parameters, requiring that, for example, the return on capital be set at a level at which

[5] Of the 18 local government significant water business activities to which monopoly prices oversight would apply, 14 have been commercialised, with the remaining 4 implementing full cost pricing.

[6] The Authority is required to assess reform implementation by local governments for the purposes of recommending payments from the Local Government Financial Incentive Payments Scheme. The Scheme covers reforms to all local government businesses, with specific emphasis on competitive neutrality and COAG water reforms.

the local government considers a comparable private sector entity would be able to obtain capital in the market (s68(1) refers) and that depreciation be based on the deprival value of the asset allocated over its useful life, or another amount considered appropriate in the circumstances (ss66(1)-(2) refers).

The Department of Communication and Information, Local Government and Planning and Sport has developed guidelines to assist councils in the application of competition reforms and full cost pricing. These guidelines are intended to cover all business activities, including water and sewerage functions. Where appropriate, the Authority has taken the relevant provisions of these guidelines into account.

Monopoly prices oversight typically requires that prices reflect efficient costs. Competitive neutrality requirements suggest that consideration should be given to the actual costs of service delivery, so as to maintain incentives for efficiency improvements and to ensure that government-owned businesses are not advantaged over any private sector rivals. In practice, transitional pricing strategies would be adopted to adjust prices progressively to reflect efficient costs.

Competitive Neutrality and the Rural Water Sector

State government water business activities need to be declared under the *QCA Act 1997* before being subject to the Authority's jurisdiction. While all the business activities of SunWater have been declared for the purposes of competitive neutrality, the declaration is unlikely to impact upon rural water provision as prices will be set by the Queensland Government. The declaration may, however, be relevant to a rural scheme providing water to urban or industrial users.

5. MONOPOLY PRICE REGULATION

5.1 Alternative Approaches

General Approaches

General approaches to pricing regulation include rate of return regulation, incentive regulation and hybrid approaches.

Monopolies' prices may be regulated directly, or indirectly by setting constraints on the revenues they are able to earn.

General approaches to the regulation of prices applied by monopolies providing infrastructure services include:

- *cost-of-service*, or *rate of return* regulation[7] – where regulators determine the revenue required in order to recover an allowed rate of return on the business' rate (asset) base, plus an amount to cover its variable and other fixed costs;

- *incentive regulation* – where adjustments to existing prices or revenues are imposed, without direct reference to the costs of service provision; or

- *hybrid approaches* – where price or revenue cap approaches are applied in conjunction with incentive regulation measures over a defined regulatory period.

These approaches may be applied for both monopoly prices oversight and third party access reviews. The hybrid approaches (price and revenue caps) are reviewed below.

Revenue Caps

Revenue caps use a building block cost structure to define a maximum revenue requirement.

Under revenue cap regulation, a maximum revenue requirement is defined for the business entity, usually set by reference to a cost structure determined using a 'building block' approach (see Chapter 6).

Revenue caps provide the regulated business with capacity to vary prices of the various products and services it provides within an overall revenue constraint. This gives considerable flexibility to respond to market developments through the introduction of new forms of tariffs.

Examples of revenue caps include…

Examples of revenue cap regulation include:

- *fixed revenue* caps, which set a maximum total revenue that may be collected from the regulated service over a defined period;

[7] A less common alternative to the 'utility', or rate of return approach, is the 'cash needs' approach, where user charges are structured to recover specific cash requirements for operating and maintenance expenses, plus some capital items – essentially the forecast cash budget requirements for the business (Raftelis 1993). The major difference between the approaches is the treatment of capital expenses. In practice, regulation often borrows elements from each approach, with the cash-needs approach providing a 'check' against the appropriateness of the prices and revenue outcomes implied by cost-of-service regulation.

- *average revenue caps*, which set controls on per unit revenues; and,

- *variable revenue* caps, where allowed revenues are linked by a predetermined formula to exogenous variables such as demand growth or cost drivers.

There also are examples where revenue caps are applied in combination with side constraints on pricing or particular pricing principles with which the regulated business must comply. Revenue caps may also be applied to particular customers or services within a water supply business.

Price Caps

Price caps directly apply to actual prices for goods and services.

Price caps directly control the actual prices for goods or services provided by the regulated business. The most direct form of price cap regulation occurs where the regulator controls individual prices. Price caps also may be applied to the average price of a representative group of services (the so-called tariff basket), giving the regulated business greater flexibility to manage prices for different services. The volume of water sold becomes a key driver of total business revenues.

Prices may be varied using a CPI-X annual adjustment.

Typically in contemporary price cap regulation, an initial set of prices is developed from the maximum revenue requirement with prices adjusted (either up or down) over the defined regulatory period, usually through some variant of CPI-X price indexation. Like a revenue cap, the price cap may be applied to particular customers or services, but is established on a unit basis, such as per kilolitre or megalitre rather than as a total revenue amount.

Issues in Applying Price or Revenue Controls

Issues include effectiveness, pricing efficiency and flexibility.

In general, the nature of the monopoly pricing or access issue being considered determines which of the various price and revenue controls is most appropriate. However, key issues in assessing the relative merits of price or revenue-based controls include:

- effectiveness in constraining monopoly behaviour;

- incentives/capacity for the regulated business to set efficient prices;

- encouragement of efficiency and cost reductions over time;

- allocation of risk between the business and users;

- flexibility and the capacity to adapt to product/price innovation; and,

- the relative availability of information to the regulator.

5.2 Monopoly Price Regulation in Australia

Monopoly Prices Oversight

COAG has defined an upper bound as the maximum revenue a water business can recover while avoiding monopoly rents.

The COAG Water Resource Policy was refined by the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) at its 1998 Hobart meeting. Under this approach, to *avoid monopoly rents*, a water business should not recover more than operational, maintenance and administrative costs, externalities, taxes or tax equivalents, provision for the cost of asset consumption and cost of capital, the latter being calculated using a weighted average cost of capital (the "upper bound").

The upper bound defines the maximum revenue.

This upper bound defines the maximum revenue a water business could earn before being considered to be charging excessive or monopoly prices. Combined with specific price or revenue controls, this approach forms the basis of prices oversight of monopoly water supply businesses in Australia.

The Independent Pricing and Regulatory Tribunal (IPART) of New South Wales, for example, generally constructs a maximum revenue target for the business, comprising a return on capital, return of capital and operating costs, and then sets specific price paths for water services consistent with this constraint. Price caps have been developed for the Hunter and Sydney Water Corporations on this basis.

IPART has also used a form of revenue cap for the regulation of water services provided by Gosford and Wyong City Councils, although it recently has noted concerns on the part of these entities that revenue cap regulation provides less flexibility to manage climate-induced demand variability (IPART 1999b).

In Victoria, a similar building block approach to price regulation has been used to determine prices for the metropolitan sector, representing supply of water services to residential, commercial and industrial users within the Melbourne metropolitan area. Price caps are set by the Government, and structured as two part tariffs.

Third Party Access

No third party access arrangements yet exist in Australia.

The Authority is not aware of any third party access regimes for water in Australia at the time of writing. The National Competition Council has not received any applications for declaration of water infrastructure under the national third party access provisions of the *Trade Practices Act 1974*. In addition, no voluntary access undertakings have been established with the Australian Competition and Consumer Commission (ACCC).

Access can, however, be negotiated on mutually acceptable terms without recourse to regulators. A recent example of this is the agreement between winegrape growers in the Barossa Valley and SA Water to use surplus capacity in SA Water's delivery assets, off-peak, to transport Murray River water entitlements to Barossa

vineyards. This agreement was struck outside of any formal access regime.

5.3 The Authority's Approach

Objectives

Monopoly Prices Oversight

The Authority must have regard to a number of public interest matters in prices oversight.

The general objectives of the Authority follow from the requirements of the *QCA Act*. This requires the Authority to have regard to the protection of consumers from abuses of monopoly behaviour, the promotion of competition, the efficient use of resources, and other identified relevant public interest concerns.

Third Party Access

Regulatory intervention in third party access should only occur when negotiations fail.

In general, the application of third party access in Australia has recognised that commercial negotiation should form the primary basis for the setting of access terms, with regulatory intervention only in instances where negotiation fails. This principle also underpins the access provisions set out in the *QCA Act*.

The objectives of third party access…

The objectives of the Authority in terms of third party access are derived from the relevant provisions of the *QCA Act*, and basically require that access be provided on terms which:

- promote the efficient use of the infrastructure network;
- recognise the legitimate business interests of the facility owner, including its commercial viability; and,
- are cognisant of public interest considerations, including the benefits to the public from promoting competition.

Pricing Principles

Pricing principles need to apply to a wide range of circumstances and are therefore general.

The Authority's monopoly prices responsibilities are potentially very diverse. These could range from broad, overarching investigations of declared monopoly water supply businesses, to resolution of specific pricing disputes. They could require the Authority to address pricing issues relevant to the overall business entity, specific to a particular consumer/service, for infrastructure services in isolation or, in some circumstances, for water allocations separate from these related services. Pricing principles therefore need to be applicable to all such situations.

In addition, these principles need to reflect the regulatory objectives of the *QCA Act.*

Prices set in effective competitive markets are consistent with many of the key regulatory objectives in that they ensure services are produced and sold at least cost. This ensures that the ability of monopoly or near monopoly service providers to exercise monopoly power is limited, that resources (both those related to the infrastructure service being provided and the resource) are

appropriately allocated and that competition is promoted in many markets.

Regulation also must be cognisant of the revenue needs of the facility owner (see Chapter 7).

The pricing principles…

To achieve the objectives of monopoly price regulation, including promoting economic efficiency, the Authority considers that prices of water delivered to an end user should:

- be *cost reflective* - that is, reflect the costs of providing the service and, where the demand for water exceeds its supply, potentially incorporate a resource value;
- be *forward looking* - in that they represent the least cost which would now be incurred in providing the requisite level of service over the relevant period;
- ensure *revenue adequacy* - the revenue needs of the business must be addressed where possible;
- promote *sustainable investment* - where the services are to be maintained into the future, the investor must be given the opportunity to enjoy an appropriate return on investment;
- ensure *regulatory efficiency* - the pricing method which minimises regulatory intrusion and compliance costs relevant to a particular circumstance should be adopted; and,
- take into account matters relevant to the *public interest*. Many such matters are identifiable in the *Queensland Competition Authority Act 1997.*

Preference exists for the least prescriptive form of price regulation.

In respect of regulatory efficiency, preference will be given to the least prescriptive form of price regulation, and to those measures that provide for an appropriate degree of flexibility to the regulated water business.

For example:

- where assessment is required as to whether a business/service is recovering excessive (monopoly) levels of revenue, the maximum revenue requirement may be sufficient to set the revenue benchmark for both monopoly prices oversight and third party access;
- where the Authority is required to establish prices for defined services, or address third party access for a segment of a network, price or revenue caps could be used either for prices oversight or third party access purposes consistent with the benchmark maximum revenue

requirement;

- for pricing disputes involving particular consumers or services, including third party access disputes or complaints regarding the pricing practices of private sector water supply activities, the Authority may consider it necessary to set specific prices, as well as other relevant terms and conditions of supply; and,

- for monopoly prices oversight, the Authority may consider it necessary to impute a value for the water resource, where this is sold independently or included as part of bundled water services.

6. MAXIMUM REVENUE REQUIREMENT

6.1 The Maximum Revenue Requirement

Setting a maximum revenue requirement provides the basis for most approaches to establishing prices.

A maximum revenue requirement establishes the total amount of revenue that an efficiently operated business would need to remain commercially viable, but not enjoy monopoly profits. It is generally expressed on an annual basis (the annual revenue requirement). This is consistent with the relevant full cost pricing requirements of the *Local Government Act 1993*.

It is made up of three building blocks….

The maximum revenue requirement is comprised of the following "building blocks":

- a *return on capital* – based on a weighted average cost of capital applied to a regulatory asset base valued according to the deprival method;
- a *return of capital* – based either on a renewals annuity approach, or other suitable depreciation method; and,
- *operating and maintenance costs* – based on efficient costs, relative to the appropriate scale of operation, and including tax equivalents (where applicable).

The revenue requirement is not intended, nor should it become, a guaranteed level of revenue that the business will recover. Actual returns may fall short of the revenue level established by the maximum revenue requirement, depending on factors such as whether the business meets demand forecasts, operating expenditure projections or whether capital expenditure estimates are realised. The water industry is characterised by wide variations in climatic conditions which will affect demand, operating expenditures and returns to the service provider.

To ensure that the maximum revenue requirement is appropriate to the needs of the service provider the Authority will also assess it against relevant financial and cash flow benchmarks. Table 6.1 below outlines the indicators and ranges used by Ofwat in assessing the implications of its price determination for water and water and sewerage companies in England and Wales.

Table 6.1: Ofwat financial and cash flow indices

Indicator	Water and sewerage companies	Large water only companies	Small water only companies
Historic cost interest cover	Min 2x	Min 2.25x	Min 2.5x
Average gearing	45-55%	45-55%	45-55%
Cash interest cover (EBITDA basis)	Min 3x	Min 3.4x	Min 3.75%
Cash interest cover (EBIDA basis)	Min 2x	Min 2.25x	Min 2.5%
Debt payback period (EBITDA basis)	Max 5 years	Max 5 years	Max 5 years
Debt payback period (EBDA basis)	Max 7 years	Max 7 years	Max 7 years
Cashflow to capex ratio (EBDA basis)	Min 40%	Min 40%	Min 40%

Notes: Gearing measured as a proportion of debt to debt plus equity.
EBITDA refers to Earnings Before Interest, Tax, Depreciation and Amortisation (net cash flow); EBIDA refers to Earnings Before Interest, Depreciation and Amortisation; EBDA refers to Earnings Before Depreciation and Amortisation.

6.2 Regulatory Asset Base

The regulatory asset base provides an initial step in establishing 'building blocks'.

The value of the regulatory asset base is important to the establishment of the maximum revenue requirement as it provides the basis for determining the value of the return on capital and in some instances, depreciation.

The regulatory asset base consists of those assets necessary for the provision of the regulated (usually monopoly) services. These include current assets (including working capital) and non-current assets.

The main regulatory issues of some contention relate to the valuation of non-current assets (including network assets) and the treatment of new capital expenditure, contributed assets, capital subsidies and ancillary assets such as flood mitigation works.

Valuation of Non-Current Assets

For the purposes of establishing the maximum revenue requirement, non-current assets are valued at the beginning of the regulatory period. Such valuations typically are then undertaken every three to five years because of the costs involved.

Value and Cost Based Approaches

Asset valuation methods can be value-based or cost-based.

Asset valuation methods can generally be categorised as either:

- *value based* - which determine the value of an asset largely from its cash generating capacity, or the cash generated by selling the asset (net realisable value); or

- *cost based* - which relate the value of an asset to the cost of purchasing the asset.

Value-based approaches have a problem with circularity.

There are advantages and disadvantages with each of these approaches. Value based approaches, for example, typically require a significant amount of information and potentially are affected by the problem of circularity – where the asset value is determined by (regulated) prices and revenues which, in turn, are based on the asset value.

Cost-based approaches are more easily established but may be less relevant for long-life assets.

Cost based approaches, such as historical cost or depreciated actual cost, are generally regarded as less costly to establish and administer and reduce the risk to asset owners of the impact of technological change. However, cost based approaches are less relevant to current and future economic decision making, and particularly for long-lived assets during persistent periods of inflation.

Other current cost methods …

Other *current* cost based valuation methods have been developed to attempt to overcome these shortcomings and to establish a more relevant and appropriate valuation. These include:

- *reproduction cost* – the cost of reproducing the existing plant in substantially its present form using the production

technology and specifications of the original asset. This approach is most relevant where a similar asset is available and the technology and capacity requirements have not changed markedly;

- *replacement cost* – an estimate of the current cost of replacing an asset with similar assets (not necessarily the same) which can provide equivalent service potential/capacity. Replacement cost more closely approximates the actual cost of entry to the market, although it requires considerable judgement and expert advice; and,

- *depreciated optimised replacement cost* – the cost of replicating the required service potential of the assets in the most efficient way possible, from an engineering/economic perspective, while allowing for the age of the existing assets through depreciation.

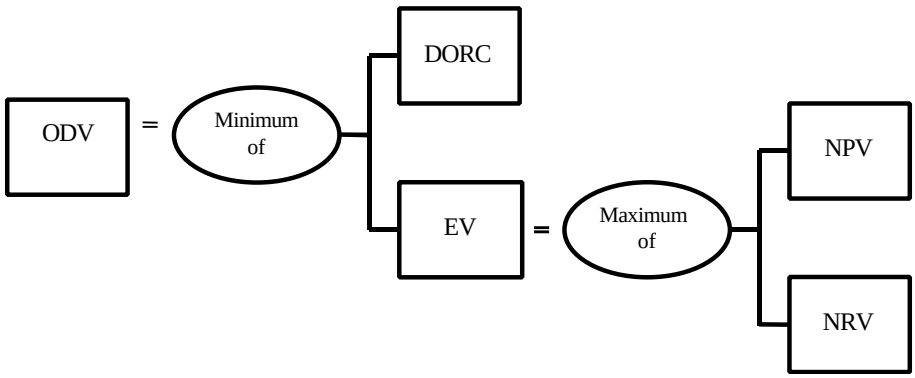
Deprival Value Approach

Deprival value is a hybrid approach measuring the loss to the entity if deprived of the asset.

A third approach considers both the value and cost based approaches to arrive at an asset value. This hybrid approach, referred to as the deprival value method, defines the value of an asset as the loss that might be expected if the entity was deprived of the future economic benefits of that asset, or alternatively an amount that represents the loss of service potential flowing from the asset.

Deprival value[8] is defined as the lesser of the depreciated optimised replacement cost (DORC) and the economic value of an asset, where the latter is the maximum of the asset's net present value (NPV) or net realisable value (NRV).

Figure 6.1: Optimised deprival value



COAG has endorsed the use of deprival value.

Deprival value has been endorsed by COAG as the preferred approach to valuing network assets for public reporting processes (performance monitoring) and by ARMCANZ as a basis for water pricing, unless specific circumstances justify another method. Deprival value also is a fundamental component of the

[8] Although the concept of deprival value is common to both pricing and financial reporting for local government-owned water businesses, it is likely that, in practice, these would be applied differently (and at different times) and would produce different valuations.

competitive neutrality pricing requirements for Queensland local government business activities (as set out in the *Local Government Act 1993*).

This approach is generally considered to provide the best estimate of what a private sector service provider would pay for a similar asset, given prevailing and expected market and other conditions.

The Authority supports deprival value.

The Authority considers that deprival valuation is the most appropriate method of establishing the value of the regulatory asset base for the water sector for the purposes of prices oversight and third party access.

In setting a maximum price for monopoly prices oversight, DORC provides the 'ceiling' to asset valuations above which businesses would be considered to be receiving 'monopoly' returns (ie, returns above those sufficient to sustain investment and commercial operation).

Optimisation

The asset base needs to be optimised.

Optimisation is fundamental to deprival value. It provides for the valuation to be based on the 'optimal' configuration of the network system, allowing for advances in technology and design, and eliminates unwarranted excess capacity from the asset base. It thus reflects the outcomes of a competitive market and provides a forward-looking dimension to valuation. It ensures that regulated prices do not reflect previous 'gold-plating' of infrastructure, and also minimises incentives for inefficient bypass of the network.[9]

Key issues in the application of optimisation include:

Optimisation may be based on a complete redesign or on an incremental development approach.

- *greenfields* versus *incremental* – the greenfields approach assumes that the network can be completely redesigned such that it has the optimal planning horizon capacity and minimum operating costs. The use of the greenfields approach best reflects that cost which an efficient water supplier operating in a competitive market would put in place and therefore represents the preferred basis for optimisation. It is recognised that for some large urban water suppliers, such an approach may result in network configurations that cannot practically be achieved. An alternative approach, the incremental (or "brownfields") approach, is based on the premise that the existing assets would be replaced using fundamentally the same configuration as used presently with adjustments introduced to ensure that only assets relevant to providing the desired level of service provision are incorporated. While the greenfields approach is conceptually most

[9] Bypass occurs when it is cheaper for current or prospective purchasers of network services to construct and operate an alternative service themselves, rather than use spare capacity within the existing network. For the urban water sector, bypass may include the construction of 'stand-alone' distribution facilities from a bulk source, on-site storage or extraction (such as tanks for domestic consumers or direct use of underground acquifers if available) or the development of water re-use options (most common in industrial water applications).

Optimised values should exclude unwarranted excess capacity and redundant assets.

appropriate, the difficulties associated with its implementation may require recourse to an incremental approach. Accordingly, at a minimum, entities should exclude unplanned excess capacity and ensure that fully redundant assets are removed from the regulatory asset base;

Planned excess capacity should be retained in the asset base.

- *planned excess capacity* – for most water utilities there are considerable benefits in terms of minimising total costs from installing assets to meet not only existing demand, but also to allow for a reasonable (expected) level of growth in demand. Generally, planned excess capacity, where it is considered necessary to produce the lowest long-run total cost, on a present value basis, should be retained in the optimised asset base;

- *negative optimisation* – where asset valuations previously have been excluded as a result of optimisation. Optimisation in a current period should allow for the asset to be re-introduced into the asset base where there has been or is likely to be a sufficient increase in usage.

In the water sector, the level of demand has typically been established without reference to the costs associated with its consumption, and so, as a result, may not be the level of demand that would apply if the full cost of supply was being charged. This can create problems when seeking to optimise the asset base as it is not clear what level of demand should be adopted. In practice, therefore, the existing level of demand usually forms the basis for optimisation in the initial regulatory period.

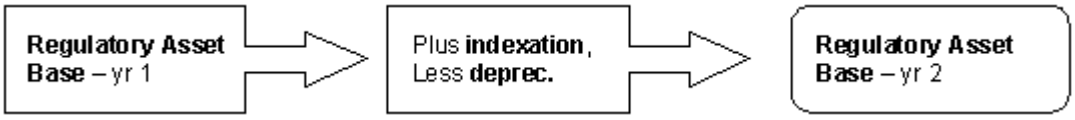
The Authority considers that optimisation is an appropriate and necessary component of the process for establishing the regulatory asset base for urban water utilities.

Rolling Forward the Asset Base

Asset values should be rolled forward, adjusting for inflation and depreciation.

Once an opening value of the regulatory asset base has been established, there is a need to adjust this valuation to reflect anticipated changes over the regulatory period. This process commonly is referred to as 'roll forward'.

Because of the costs involved in a comprehensive asset revaluation, roll forward generally is effected by inflating the regulatory asset base using a defined index. A likely approach would be to use a published indicator, such as the CPI, to index the regulatory asset base as this is simple and transparent.



New Capital Expenditure

Actual reasonable capital expenditure can be included in the regulatory asset base.

Capital expenditure (capex) may be required as a result of new statutory obligations, network growth, major asset refurbishment/replacement requirements or requirements for improved supply reliability. Generally, regulators permit actual (reasonable) capital expenditure to be included in the asset base within the regulatory period.[10]

The National Gas Code, for instance, permits forecast capital expenditure to be added to the regulatory asset base in the year in which the relevant assets are expected to be brought into service.

Where there are large and irregular capex projections, these may be 'smoothed' over the regulatory period. Smoothing has the advantage of allowing water businesses to manage fluctuations in capex requirements without undue price variability, but can result in consumers paying for capacity that they are not yet utilising.[11]

Businesses should provide supporting evidence of planned capex.

The Authority would require evidence to support any planned capital expenditure over the regulatory period. This could take the form of marketing studies and assessments of current capacity utilisation. Other options include reviewing previous capital expenditure proposals against actual expenditures (where relevant), and considering proposed capex against criteria such as: the maintenance of baseline performance standards, desired increases in performance standards, requirements for network demand growth, new customer connections and additional regulatory or legal requirements (Theaker 2000).

Capex for capacity augmentation may be deferred by the adoption of demand management strategies such as sprinkler hours, sponsoring low water use technology such as dual-flush toilets and low-flow shower heads, and reduction in system leakages. These strategies may have an impact on capital or operating expenditure during the regulatory period.

Overspending or underspending on capex can trigger a reconsideration of regulatory settings.

Where businesses overspend on capital relative to projections, consideration needs to be given to whether such expenditures are reasonable[12] and whether it should be reflected in the regulatory asset base in subsequent periods. Where such over-expenditures are (expected to be) substantial, and material in the context of the overall regulatory asset base, consideration would need to be given to re-opening any regulatory determinations to ensure that

[10] Assessment also may be required as to what proportion of anticipated capital expenditure constitutes a renewals expense (ie, asset refurbishment), and therefore what amount should be capitalised into the regulatory asset base.

[11] The full cost pricing requirements of the *Local Government Act 1993* require local government water businesses to match projected total revenue with projected total costs over the local government's financial year. There are, however, separate provisions that give local government water businesses greater flexibility in setting actual charges and which could accommodate some degree of smoothing of lumpy capital expenditure profiles.

[12] Avoidance of regulatory micro-management also needs to be considered. In the United States, State based Public Utility Commissions commonly are asked to agree minor capex/opex proposals, so that these can be included in the regulatory asset base allowable revenue limit. Many smaller water companies find this process overly complex, and it requires substantial regulatory involvement.

appropriate incentives are in place to maintain service quality.[13]

Where capex by a water business or by a competitor results in stranded assets, adjustments to the regulatory asset base may be required. Assets would not be considered to be 'stranded' if they must continue to be maintained due to supplier of last resort requirements.

Where actual capex is less than that forecast, companies are typically allowed to earn a return on the forecast amount, provided service quality does not deteriorate, although the regulatory asset valuation is reduced to reflect actual expenditure for subsequent regulatory periods. Again, substantial underspending could in some circumstances trigger a reconsideration of relevant regulatory settings.

Contributed Assets and Capital Subsidies

Contributed Assets

Contributed assets are those funded or provided by users.

Contributed assets are those assets that are funded or otherwise provided by, or on behalf of, water users. Assets may have been contributed in the past through transfer of ownership of a facility, direct payment for the facility involved, a capital contribution towards an expansion of existing facilities or through payments for developed land.

Under the *Integrated Planning Act 1997*, developers may still be required to construct or contribute financially to the construction of certain local government infrastructure items, including urban water infrastructure facilities. External contributions also may be sought for works undertaken by urban water boards or for other water services businesses.

There are strong equity and efficiency grounds for recognising past capital contributions.

Recognition of past capital contributions is primarily argued on equity grounds. Contributing users contend that they should not be charged a return on that component of assets which they have already funded. Recognition is also argued on the grounds of economic efficiency in that further investment could be retarded if investors become concerned that future contributions may not be recognised by the regulator. Arguments for recognising future capital contributions are also based upon both perceived equity and efficiency implications.

By contrast, there may be reasons why contributed assets should not be recognised.

There is no economic rationale for treating contributed assets differently to other assets. Arguments against the recognition of *contributions* made by users include:

- the contribution was or is sought to recover costs of providing services not otherwise incorporated in a utility's tariff structure;

[13] If regulated businesses are not permitted to recover reasonable maintenance expenditure requirements, maintenance spending may fall below appropriate levels, with potential negative implications for service quality standards.

- the contributor has already received (or will receive) offsetting benefits, such as reduced water charges;
- the remaining service potential of the relevant assets is negligible; or
- recognition results in the preference of one form of charging over another.

Poor information, the cost of administration and considerations of materiality may also render the recognition of past contributions infeasible or undesirable from a cost effectiveness perspective.

Approaches to the Treatment of Contributed Assets

Recognition of past contributed assets depends on the circumstances.

There is no simple answer to the treatment of capital contributions. Capital contributions need to be considered in the context of a pricing framework that promotes rational economic behaviour. Recognition of prior capital contributions in the setting of prices depends on the particular circumstances surrounding the capital contribution, particularly the expectations of the parties at the time the capital contributions were made.

Contributed assets may be recognised by two means.

Where it is proposed to recognise capital contributions, different approaches have been proposed. In general these involve either:

- including the contributed assets in the regulatory asset base, but employing some form of offsetting mechanism to account for the contribution; or
- excluding contributed assets from the regulatory asset base for pricing purposes.

These approaches can be applied either in a backward-looking framework, for previous capital contributions, or in a forward-looking sense for anticipated future contributions.

The Authority prefers to include contributed assets and apply an offset to prices.

In general, the Authority prefers to include the assets in the asset base together with some form of offsetting mechanism to account for the contribution as :

- once assets are passed to the business entity, that entity in effect assumes responsibility for their management and the risks and obligations associated with that responsibility; and,
- such a practice is consistent with the financial reporting practices of the mainly local government businesses which deliver most urban water services.

Specific arrangements between water businesses and users should be recognised.

The Authority's preferred approach would be for any specific "arrangements" between identifiable contributors and the water business to be recognised by adjusting prices for those specific users in accordance with the terms of the contribution

arrangement. This provides scope for users and water businesses to structure deals consistent with their relevant circumstances.

Where such agreements are not in place, and it is still proposed to recognise capital contributions, contributions should be recognised by way of specific financial 'credits' to the relevant contributors. This generally would take the form of a series of offsetting reductions in (fixed) water charges over the life of the relevant assets. This approach preserves the direct link between the amount of the contribution and the actual charges levied on the contributor.[14]

It is recognised, however, that such an approach may be impractical and administratively complex where there are a large number of contributors each with different circumstances. In these instances, the aggregate value of contributions may be converted to an annuity and recognised as revenue over the life of the relevant assets. This approach reduces the amount of revenue the water business needs to recover from other sources, including user charges, with the net effect of uniform reductions in fixed water charges for all consumers in particular categories.

For water businesses with relatively consistent growth and forecast capital contributions, a future contribution could be amortised over a much shorter period – even the year in which it is received.[15]

Capital Subsidies

Capital subsidies form a specific form of contributed assets.

Capital subsidies form a specific sub-group of contributed assets, and generally refer to subsidies provided by the State Government to various water businesses. Local government water services businesses, for instance, have acquired significant assets that have been funded, in full or in part, through grants from other levels of Government.

The most significant capital grants scheme is the Local Governing Bodies Capital Works Subsidy Scheme, which provides for grants of up to 40 per cent of the capital cost for construction of eligible assets. Funding also is provided under schemes such as the Small Communities Assistance Program, which provides assistance for the development of new water supply and sewerage services or the upgrading/expansion of existing schemes.

Alternative options for dealing with capital subsidies…

Options for dealing with capital subsidies include:

- treating the subsidy as an equity injection, with no consequent changes to pricing arrangements;
- recognising the subsidy as revenue in the period in which it is received, in addition to including in the entity's asset

[14] In effect, the contribution is recognised for pricing purposes as a 'pre-payment' for services not yet received.
[15] This is the approach adopted in Queensland for the treatment of capital contributions to electricity distribution businesses. Under this approach, contributed assets are added to the regulatory asset base in the period in which they are received, with an equivalent amount deducted from the revenue cap for that period.

base any assets funded by the subsidy; and,

- for past grants, amortising the value of any past grants over the remaining life of the relevant assets and including this amount as revenue to offset the amount required of other revenue sources.

Where there is no agreement or specified purpose, the treatment of past and future grants should be at the asset owner's discretion.

The appropriate approach to regulatory recognition of capital subsidies depends, largely, on the purpose of the grant. In this regard, the purpose may include employment generation, assisting local government to meet funding shortfalls or reducing the service costs to a particular consumer or group of consumers. In the absence of any specific agreement or agreed purpose, or evidence to suggest that a particular outcome was intended, the treatment of past and future grants should be at the asset owner's discretion.

Flood Mitigation Assets

Some storages provide flood mitigation services for downstream users.

Some water facilities, notably major storages such as dams and weirs, provide flood mitigation services to downstream catchments. It is necessary to determine how assets, or parts of assets, that have been provided for services other than the provision of water for consumptive uses should be addressed for regulatory purposes.

Somerset and Wivenhoe dams, which supply water to various South East Queensland urban water utilities, both have capacity above their respective full supply levels[16] which is normally empty and which can be used to temporarily store flood waters when required.

The Authority understands that there is no existing State Government policy on the treatment of flood mitigation assets for pricing purposes.

Options for the treatment of flood mitigation assets are to:

- include such assets in the regulatory asset base, based on the presumption that such works are no different from other Government mandated or safety-related licence conditions and, as such, constitute a normal cost of operation;

- exclude flood mitigation works from the regulatory asset base, on the grounds that these are not integral to the provision of water services (and perhaps should be accommodated through a specific CSO arrangement).[17]

[16] The maximum level at which water is stored in a dam is referred to as its Full Supply Level. Wivenhoe Dam, for example, has 1 165 000ML of storage at its Full Supply Level, with a further 1 450 000ML above this for temporary storage of floodwaters. This flood storage is held empty except when required to store flood flows (South East Queensland Water Board 1998).

[17] Indeed, flood mitigation works may be considered 'public goods', in that consumption by one individual, in terms of the reduced prospect or severity of flooding, does not impact on the consumption by others (ie, non-

If there are no specific funding or CSO arrangements, the Authority will include the assets in the asset base.

Given that there may be differences between the beneficiaries of flood mitigation works and users of water from relevant infrastructure facilities, the preferred approach would be for these works to be funded by the beneficiaries.

In the absence of any specific arrangements relating to *flood mitigation works*, the Authority would propose to include these works in the regulatory asset base for pricing purposes.

Recreational Facilities and Other Assets

Significant assets may be associated with recreational and environmental services.

For many water storages, there are significant assets associated with the delivery of other services such as recreational amenity or environmental requirements. Examples of the former are picnic facilities, boat ramps, and public safety infrastructure, while environmental requirements could include fish ladders.

These assets would be included in the regulatory asset base in the absence of any specific arrangements.

The preferred approach is for beneficiaries to meet the cost of recreational services where practical and cost-effective. Costs related to environmental requirements may be considered to be legitimate costs of business.

In the absence of any specific arrangements, the Authority would include these works in the regulatory asset base for pricing purposes, provided the service provision was not excessive.

6.3 Return on Capital

Opportunity Cost and the Cost of Capital

Once a regulatory asset base is established, it is necessary to determine a rate of return in order to establish the cost of capital.

The rate of return represents an opportunity cost of foregone investments with similar risk.

The rate of return is the return expected by investors in capital markets for investments of a given level of risk, and represents the opportunity cost to investors of expected returns on foregone investment opportunities - that is, the expected return from the next best alternative investment. The rate of return plays a central role in rewarding or compensating the facility owner for its past investment, and also in providing guidance as to the return on future investment in the network. For example, where the rate of return is set above the business' actual cost of capital, there is an incentive for the regulated business to over-invest and to substitute capital for other factors of production (Averch and Johnson 1962).

The COAG Water Resources Policy requires that publicly-owned urban water supply businesses and, where practical, rural water supply businesses, earn a real rate of return on the written-down replacement cost of their assets, commensurate with the equity arrangements of their public ownership. Further, the ARMCANZ/SCARM pricing principles refer to the weighted

rivalry) and as it is difficult to exclude 'non-paying' consumers from benefiting (non-excludability). Further, there may be differences between the users of water services and the beneficiaries of flood mitigation works.

average cost of capital for this purpose.

Weighted Average Cost of Capital

A WACC rate is the average of the return to debt and return to equity.

The generally accepted regulatory approach to establishing the rate of return is to estimate a weighted average cost of capital (WACC). The WACC method is based on the presumption that capital is provided from two sources – debt and equity. It is calculated as the average return to each of these sources of finance, weighted to account for the relative proportions of debt and equity to total capital. This method requires estimates of the current market values of the business' debt and equity, a capital structure and market rates for both sources of funds (see Appendix B).

The after tax WACC for a company (assuming that dividend imputation credits are not included in the company's cash flows) is calculated as follows:

$$WACC_{after\ tax} = (1-t)\left[r_e\ /(1-t(1-\gamma)) \bullet E/(E+D) + r_d \bullet D/(E+D)\right]$$

Where:
r_e = expected after tax return on equity
r_d = before tax cost of debt
D = market value of debt
E = market value of equity
t = corporate tax rate
γ = assumed utilisation of franking credits (adapted from Officer 1994).

The return on debt is affected by the gearing of a business and its cash-flow stability.

The cost of debt is usually defined as the marginal rate at which the business can raise debt financing. This rate will vary depending on the default risk of the borrower, which, in turn, will be affected by the gearing of the business, volatility of its cash flows and the long term security of its revenue and profit flows. The return on debt would therefore reflect the cost of debt for the urban water sector although it would take into account differences in the levels of gearing considered appropriate to the entity.

The Authority considers that a reasonable gearing for regulatory purposes is 50%.

In general, the Authority considers that gearing of 50 per cent provides a reasonable starting point for the purposes of estimating the regulatory cost of capital for water supply businesses. However, for the purposes of establishing the weighted average cost of capital, the Authority would establish a capital structure suitable to the individual characteristics of the regulated business.

The cost of equity can be derived using CAPM.

The cost of equity is not generally observable for government-owned businesses that are not listed on a stock exchange. In these circumstances, a number of alternative models have been developed to estimate the cost of equity funds, including the Capital Asset Pricing Model (CAPM), Dividend Growth Model, Price/Earnings ratio and Arbitrage Pricing Model. These

approaches are discussed in more detail at Appendix A.

Capital Asset Pricing Model (CAPM)

CAPM determines a return on equity using a risk factor, beta.

CAPM determines the return on equity using a single risk factor related to market return and may be represented as follows:

$$r_e = r_f + \beta_e(r_m - r_f)$$

Where:
r_e = expected after tax return on equity
r_f = risk free rate of return
r_m = return on the market as a whole
r_m-r_f = market risk premium
β_e = equity beta

CAPM is widely used.

CAPM is widely used and accepted by practitioners in calculating the cost of capital for companies in both the public and private sector. It is also widely adopted by regulatory bodies in Australia because CAPM is more objective than alternative models, conceptually simple in terms of defining and assessing β_e, and may be applied across industries while other approaches may only be used in some industries. Ofwat, however, notes that there is no single satisfactory approach to determining the cost of capital and employs both the CAPM and Dividend Growth Models (Ofwat 1998).

6.4 Return of Capital

The return of capital measures the decline in the value of an asset's service potential.

An asset consumption charge seeks to measure the decline in service potential from use of an asset. This charge is variously referred to as a depreciation charge, or the return *of* capital.

Where demand warrants continued service provision, the consumption charges should aim to provide a cashflow sufficient to maintain the service potential of the relevant water asset/network.

For many water facilities, asset consumption and return on assets can represent up to 85-90 per cent of the total economic cost of providing water services, suggesting that derivation of estimates for these cost components is a critical regulatory issue (Baxter 1999).

There are broadly two approaches to establishing an asset consumption charge, namely:

- cost-based depreciation charges; or
- renewals annuities.

Cost-Based Depreciation

Depreciation charges usually seek to measure the loss of service potential associated with an asset by reference to its initial cost. Such cost-based depreciation charges attempt to allocate the

Cost-based depreciation charges may over-estimate the usage of service potential in long lived water assets.

original cost of an asset over its estimated (remaining) useful economic life, with the asset base 'depreciated' or 'written-down' in each period to reflect the return of capital to the business. Some regulatory jurisdictions, such as the Federal Energy Regulatory Commission in the United States, determine depreciation based on historical cost asset values.

For the water industry, and particularly given the inability to accurately determine the lives of some water assets (for which the useful life may extend beyond 100 years), cost based depreciation may result in a depreciation charge which exceeds the actual revenue requirement for the maintenance of the service potential of the asset.

Central issues are the assessment of the useful life of the asset (eg, whether time or output based), the pattern or method of depreciation (eg, straight line or units of production), and the estimate of the salvage or residual value that may be realised at the end of an asset's useful life.

Asset values may also be established under a value or hybrid method. Under the *Local Government Act 1993*, water and sewerage businesses for which full cost pricing reforms (in its various guises) have been applied are required to calculate depreciation for pricing purposes based on the deprival value of the asset.[18] In general, the depreciation base should be consistent with the asset value adopted for determining the amount of the regulatory rate base.

Renewals Accounting

Renewals accounting focuses on the refurbishment needs of network assets.

Under the renewals accounting approach, the infrastructure asset network is considered an integrated, renewable system to be maintained in perpetuity, rather than a collection of individual assets each with its own asset life and maintenance requirements. Demand is considered sufficient to warrant continual extension of the asset system life by this renewal.

Frequently, the asset consumption charge is set as an annuity to reflect the costs of necessary refurbishment/rehabilitation of individual parts of the network over a relatively long period of time, without any direct reference to the (historic/actual) cost of the assets in question.

The essential input to a renewals annuity approach is the asset management plan. Taking account of the age, condition and service capacity of the system, a total maintenance plan is developed which identifies the most effective operating lives and times for replacement of all assets which, together, comprise the system or network. An expenditure program, in some cases as long as 35 years, is then developed to both replace component parts of the system when required and to carry out all other operations and maintenance. These expenditure projects are

[18] The Act also provides that a local government may use another amount for depreciation, a provision which is intended to allow local governments to apply a renewals annuity approach to determining an asset consumption charge, or another supportable method

converted to an annuity and an asset restoration reserve is established to carry the accumulated balance (whether unspent or overspent) of this annuity charge.

Major expansions to the network, such as the addition of a new storage or additional transmission link, would form part of the capital expenditure. These would need to be dealt with separately, as would other 'assets' that do not comprise part of the overall network (such as office equipment, motor vehicles and other ancillary assets used by a water services business).

The advantages of renewals accounting include…

The potential advantages of renewals accounting include:

- the existence of higher quality information about the total system or network that the overall plan provides;
- the relevance of future costs to future planning decisions;
- the annuity method smooths out lumpy annual operating and maintenance costs;[19] and,
- the regulatory certainty that can follow such an approach, in that it establishes for a long period of time the relevant asset consumption charge.

The major disadvantage of a renewals annuity relates to the difficulty of developing realistic long term asset management plans.

Variations on the renewals annuity approach have been adopted by a number of other jurisdictions, including Ofwat in the United Kingdom.[20] Ofwat establishes an annual infrastructure renewals charge calculated as the average over several years of the forecast infrastructure renewals expenditure required to maintain the serviceability of the infrastructure network. The infrastructure renewals charge effectively takes the place of both depreciation and major maintenance expenditure. Differences between actual infrastructure renewals expenditure and the estimated infrastructure renewals charge are carried forward in the business' balance sheet as an accrual or a pre-payment, with major differences redressed at price reviews.

In Queensland, amendments to the *Local Government Act 1993* have been effected to allow local governments (when applying competitive neutrality reforms to a (water) business activity) to apply a renewals approach to asset consumption charges for pricing purposes. It is understood that a number of councils have adopted this method for their water and sewerage business activities.

[19] Smoothing may lead to concerns where the asset consumption charge (annuity) differs substantially from the *actual* costs of asset consumption in any particular period. In such cases, the annuity approach results in asset consumption costs effectively being transferred forward or backwards in time, with consequent intergenerational equity concerns.

[20] In fact Ofwat uses a form of renewals accounting, of which the annuity approach is a subset.

Provision for asset consumption for all SunWater water supply schemes also will be based on condition-based depreciation in the form of a renewals annuity charge.

A range of methods may ensure that cash flow sufficient to maintain service potential is achieved.

Recent analysis undertaken by the Government Prices Oversight Commission of Tasmania, however, indicates that the straight line depreciation method (based on optimised deprival valuation for assets) can provide a reasonable estimate of the revenue required to maintain the system, under some circumstances, and with lower regulatory information requirements.

6.5 Operating Costs

Estimating Efficient Operating Costs

Operating costs must be based on efficient service delivery.

A competitive and efficient market would ensure that, in general, operating costs are minimised. Regulatory responses such as prices oversight and third party access, as a surrogate for competition, therefore require the estimation of the minimum (or efficient) costs that would be incurred by business in providing a specific service to a specific customer or group of customers (or the minimum amount that would be avoided by not providing the service to the customer or group of customers).

Benchmarking of efficiency levels is common but there can be difficulties in identifying comparable businesses.

The most common means of estimating efficient costs is to benchmark the performance of a particular utility against other relevant businesses, or to establish performance indicators independently. Under these approaches, efficiency levels for inputs, unit costs and quality of service are set on the basis of lowest-cost, highest-service standards (van den Berg 1997).

Key difficulties include the general lack of an appropriate set of businesses against which valid operational conclusions can be drawn, and the scarcity of relevant information available to the regulator. Also important is recognition of the trade-off between capital maintenance and capital costs that utilities may employ – where higher operating, maintenance and administration (OM&A) costs may be offset by lower immediate capital refurbishment expenses.

In at least one case, the relevant regulator has concluded that these difficulties are significant enough to warrant acceptance of the OM&A costs projected by the regulated organisations (at least until sufficient time has elapsed to enable a time series of comparative data to be collected).

In general, the Authority considers that operating costs should reflect efficient service delivery given the scale and nature of the business activity, and that costs would be evaluated on an individual basis including benchmarking against other relevant organisations.

6.6 Other Issues

Taxes and Tax Equivalents

The maximum revenue requirement should include tax equivalents.

Some water utilities are exempt from various taxes by virtue of their State or local government ownership. Consistent with the various competitive neutrality requirements that apply to such businesses, the maximum revenue requirement should include provision for tax equivalents that a business is liable to incur. These would include stamp duty, land tax, payroll tax, capital gains tax, and debits tax.

For larger local government water businesses to which commercialisation reforms are applied, the Treasurer's tax equivalents manual sets out in detail the approach required for treatment of tax equivalents. For smaller local government businesses that apply full cost pricing or the so-called code of competitive conduct, similar, though less extensive, requirements apply. The State-owned water boards also shortly will be required to apply tax equivalents.

Unaccounted for Water

Unaccounted for water includes water leakages and unmetered water.

Unaccounted for water in water supply systems refers to water that enters the system but is not metered on withdrawal, including losses through:

- leakage;
- theft and illegal connections, including illegal use of unmetered fire services;
- use of (unmetered) street fire hydrants for fire-fighting purposes;
- under registration from customer meters; and,
- errors in system meters (WSAA 1998).

Estimates of unaccounted for water in urban supply systems range widely, although they are as high as 28 per cent in some networks. Gold Coast Water, for example, estimates that 19 per cent of the total volume of water entering its network is unaccounted for, down from 29 per cent in 1994-95 (WSAA 1998).

Unaccounted for water should be treated as a fixed cost of the network operation.

Unaccounted for water should appropriately be treated as a network cost (and attributed amongst users as for other 'fixed' costs) provided the level of unaccounted for water is reasonable in comparison with other comparable water supply systems. Under this approach, the network owner, the party with the greatest scope to minimise unaccounted for water (at least from leakage, illegal connections etc) has responsibility for managing these costs.

6.7 Summary of Principles

Maximum Revenue Requirement

Setting a maximum revenue requirement provides the basis for most approaches to establishing prices.

The Authority may be required, or consider it necessary, to: assess particular pricing practices; establish a revenue constraint, price or revenue cap designed to constrain certain price behaviour; or, establish prices for specific services or customer groups.

The maximum revenue requirement provides the basis for most approaches. It consists of three "building blocks" including:

- an appropriate return on the capital necessarily invested in the business. This requires a determination of the appropriate value of investment in the business (the *regulatory asset base*) and the appropriate *rate of return* on that investment;
- a return *of* capital; and,
- the cost of operating the business in an efficient manner.

It is typically augmented with incentive regulation.

Establishing the regulatory asset base provides an initial step in estimating the "building blocks" underpinning the maximum revenue requirement.

Regulatory Asset Base

To establish the appropriate amount of the return on capital it is necessary to establish the regulatory asset base to which the return is to be applied.

The regulatory asset base is determined by:

- estimating the *deprival value* of the relevant assets - for monopoly prices oversight this is likely in most cases to result in the regulatory asset base being valued according to the depreciated optimised replacement cost method;
- *optimisation* of the asset network as part of the valuation process. At a minimum, entities should exclude unplanned excess capacity and ensure that fully redundant assets are removed from the regulatory asset base;
- adjusting the regulatory asset base to account for forecast (reasonable) *capital expenditure*, with such adjustments generally effected in the period in which the new investment is brought into use; and,
- recognition of *capital contributions* where warranted. This is best achieved by including user funded or contributed assets in the regulatory asset base, and establishing an offsetting arrangement with the contributor or users. In the absence of any specific agreement or agreed purpose, the treatment of capital subsidies and grants from Government should be at the asset owner's discretion.

The three "building blocks' consist of…

Return on Capital

…the return on capital

Once the regulatory asset base is established, an appropriate return on capital needs to be estimated which should reflect the level of risk in the relevant business activity:

- the *weighted average cost of capital* approach is generally considered to be the most appropriate method of estimating the cost of capital for contemporary monopoly regulation;
- for the purposes of estimating the weighted average cost of capital the Authority would establish a *capital structure* suitable to the individual characteristics of the regulated business;
- the *return on debt* would reflect the cost of debt for the urban water sector though taking into account differences in the levels of gearing considered appropriate to the entity; and
- the *return on equity* would be estimated using the Capital Asset Pricing Model (CAPM).

Return of Capital

The Authority considers that:

…the return of capital

- where demand warrants continued service provision, the return of capital should be set to provide a cash flow sufficient to *maintain the service potential* of the relevant water asset/network;
- a *range of methods*, including forms of cost-based depreciation or renewals annuity approaches, would be considered provided these can be demonstrated to meet the above objective; and,
- where *renewals annuities* are adopted, an asset management plan should be established by the relevant business activity to promote transparency, and a planning period adopted consistent with commercial principles (usually in the order of 20 to 30 years).

Operating Costs

…an appropriate estimate of operating costs.

Operating costs of any business must:

- represent efficient service delivery given the scale of operation and nature of the activity being undertaken; and,
- be evaluated on an individual basis, and usually this would include benchmarking against other relevant organisations.

7. CHARGES FOR WATER SERVICES AND WATER ALLOCATIONS

7.1 Introduction

Water prices incorporate a price for infrastructure services and a price for water.

In some circumstances the Authority may be required to set or arbitrate on prices for specific water services, groups of customers, or for water allocations separately.

In determining appropriate charges that should apply under either monopoly prices oversight or third party access, a number of difficult issues must be addressed that flow from the basic economic characteristics of the industry.

Delivered water prices effectively represent (at least) two separate components - a price for the infrastructure services associated with its harvesting, treatment, transmission and distribution, and, under certain circumstances, a price for the water itself.

The general pricing principles, which reflect the outcomes in competitive markets, have implications for the pricing of both services and water.

7.2 Pricing of Treatment, Transmission and Distribution Infrastructure Services

Efficient Prices

Prices based on marginal cost best reflect competitive market conditions.

Appropriately set prices send signals which encourage the economically efficient use of, and investment in, infrastructure. Such prices provide a normal commercial return on prudent investment and reward good investment decisions as against poor investment decisions. This will encourage appropriate levels of investment and provide incentives for businesses to give due consideration to the choice of technology embodied in the investment undertaken.

Using efficiency criteria only, the appropriate cost measure on which to base prices is *marginal cost* - the additional cost incurred by adding a unit of production. Pricing at marginal cost is generally efficient because it allows a consumer to purchase services where the value to the consumer is greater than the marginal cost of production, while at the same time ensuring that producers receive a return equivalent to the cost of supplying the additional service.

Significant issues arise with respect to whether the marginal cost should reflect simply the costs of maintaining current operations (including the maintenance of the service) or whether they should also reflect the costs associated with the future augmentation of the service potential of the facility. These issues are discussed in the context of two-part tariffs below.

Equity and Fairness

Equity considerations should be considered in setting prices.

Equity considerations also need to be taken into account and have a number of dimensions, including:

- horizontal equity – consistency with similar users;
- vertical equity – recognising income differentials or 'ability to pay'; and,
- intertemporal equity – or fairness between different users over time.

Equity is an inherently subjective concept and an 'equitable' pricing structure is likely to be interpreted differently by different stakeholders. Where alternative approaches to pricing are being considered, their equity effects should also be taken into account.

Revenue Adequacy

Pricing should ensure that a water business achieves revenue adequacy.

A key economic characteristic of the water industry is that a large proportion of the total cost of providing water services is fixed. This means that average costs reduce as the utilisation of water infrastructure increases, since fixed costs can be spread over a larger volume of water consumed. As a result, marginal cost pricing may not cover the full costs of provision of these services.

A fundamental pricing issue, therefore, is how to set price so as to get the efficiency gains related to marginal cost pricing, while providing an adequate level of revenue to the business.

Alternative approaches to ensuring revenue adequacy…

Average cost pricing would generate sufficient revenue, but will lead to the consumption of water being lower than optimal wherever decreasing costs are associated with increased supply.

Ramsey pricing divides customers into separate groups and charges a different price depending on their responsiveness to a change in price. Ramsey pricing requires that:

- the ability to on-sell the resource be limited (so that buyers at lower prices cannot arbitrage by reselling to those with higher volumetric charges); and,
- it is not possible to pay less for a given quantity by buying it in smaller lots.

Although the urban water market would generally meet these conditions, difficulties exist in accessing the necessary demand information for different customer groups.

There are additional pricing options for third party access- TSLRIC and ECPR.

For third party access pricing, additional pricing options include total service long run incremental cost (TSLRIC) pricing and the efficient component pricing rule (ECPR).

TSLRIC is defined as the cost the business would avoid if it stopped providing a particular service altogether. It includes

operating and maintenance costs, as well as a normal commercial return on capital, and allows the service provider to fully recover its costs of providing access. Pricing at *TSLRIC* means that prices may depart from the more efficient marginal cost base.

Under *ECPR* the price includes the opportunity cost to the access provider of allowing access, including foregone profits in related markets. *ECPR* effectively leaves the access provider in a revenue neutral position, and will tend to preserve monopoly profits, to the extent they already exist.

ECPR provides a high hurdle for any new entrant to clear, and limits incentives for innovation by the access provider. To the extent that it compensates access providers for losses resulting from increased competition, *ECPR* may be inconsistent with the *QCA Act* (specifically the s120 requirement that access providers be compensated for the direct costs of providing access, but not costs associated with losses arising from increased competition).

Another alternative for both monopoly prices oversight and third party access is the adoption of two part tariffs.

7.3 Pricing Water

In circumstances where water is traded, demand and supply conditions may result in a value of water above the cost of infrastructure.

Under competitive market conditions - that is, where rights to water are traded, auctioned or form part of infrastructure being sold by competitive tender - users of water may ascribe a value to the water resource above the cost of infrastructure services when it is anticipated that demand will exceed the available supply.

Where supply is not constrained and is unlikely to be constrained in the future, it is likely that the opportunity cost of water consumption will be zero, such that regulated prices would reflect only the relevant infrastructure services charges.

Where supply constraints are anticipated and there exists no effective market to provide an estimate of the value of the water resource, an alternative means of estimating the value of the water allocation is needed.

Scarcity values may arise from infrastructure or hydrological constraints.

Where supply is limited as a result of inadequate infrastructure, a strong case exists for the price to take into account the costs of future augmentation. This issue is discussed further below in respect of the structure of two-part tariffs.

Where the availability of water is constrained by hydrological capacity, the appropriate measure of the scarcity value of the water is its next best alternative use, including consideration of the value of the water *in-situ* (or in its natural state), or the value of foregone consumption.

In the absence of markets, water businesses may impute scarcity values.

In practical terms, estimation techniques include benchmarking against prices paid by others in the industry or in other basins, estimating a relevant demand function, using financial information to impute a value, or using the concept of ‘alternate cost’ which involves estimating the cost of the least expensive

substitute for use in the production process.

These approaches to water valuation are generally associated with high degrees of uncertainty, although they may provide reasonable results under some limited circumstances.

In the Australian Capital Territory, IPARC has established a "water abstraction charge" of 10c/kL, reflecting estimated environmental/catchment management costs as well as a component for the opportunity cost of water consumption. The latter component of approximately 7c/kL was imputed from the value of secondary market trading in neighbouring catchments, although the Commission acknowledges the difficulties associated with this approach. The water abstraction charge is identified separately on consumers' bills, and the revenue is remitted to the ACT Government as a pseudo-resource rent tax.

For prices oversight purposes, the issue of recognising the opportunity cost of water consumption may arise where a dispute reveals that a water supply business is recovering in excess of its maximum revenue requirement. In such circumstances, prices simply may be moving upwards to ration water supply between competing uses/users.

The Authority needs to consider the basis for prices exceeding the cost of infrastructure.

The key issue for the Authority then becomes whether the service provider is restricting infrastructure capacity deliberately or whether the situation arises from hydrological constraints.

7.4 Two Part Tariffs

Efficiency and Cost Recovery

Two-part tariffs comprise a fixed charge and a volumetric charge.

Two part tariffs as proposed by Coase (1946) comprise a fixed or access charge, and a volumetric or usage charge. The volumetric charge is typically aligned to a marginal cost measure and usually is not sufficient alone to meet the full costs of service delivery. The fixed charge takes the form of an entry fee set to recoup the balance of costs not recovered from volumetric pricing to ensure revenue adequacy.

Where two part tariffs are employed in overseas jurisdictions, the volumetric component typically makes up at least 75 per cent of the total water bill (OECD 1999a). In Australia, WSAA (1998) report that larger urban water businesses derive on average 50 per cent of revenue from usage charges.

.

Two part tariffs have been supported by COAG for water services. In Queensland the *Local Government Act 1993* provides that larger council business activities must assess the cost-effectiveness of applying two part tariffs (with smaller councils required to apply "generally equivalent" levels of reform to access funding under the Local Government Financial Incentive Payments Scheme).

Recent surveys of household and industrial water pricing in OECD countries (OECD 1999a, 1999b) demonstrate a substantial

degree of international support for the use of two part tariffs for urban water services, including a growing trend towards marginal cost based volumetric components to such tariffs.

Some utilities use more complex multi-part tariff structures, essentially variants of two part tariffs that utilise multiple fixed or usage components. The components are tailored depending on factors such as customer and supply characteristics.

Equity

Two-part tariffs can provide a fairer charging structure.

Two part tariffs can be seen as equitable from a number of perspectives - they provide that users bear the costs of their own consumption and similar users are treated similarly. There is also scope to address issues of vertical equity.[21] Pensioners and other defined low-income households, for example, may be charged a concessional fixed charge, while still facing the same volumetric charge as for other users.

The Authority considers that, in most cases a two part tariff structure would best meet the objectives of efficient pricing and cost recovery and equity and is also able to be structured to reflect any scarcity value of water.

Setting An Appropriate Volumetric Charge

Alternative Approaches

Marginal costs are usually used as a basis for volumetric charges and can incorporate a provision for future capital.

The volumetric charge in a two-part tariff is generally based on the marginal cost of service delivery. The two main measures of marginal costs are short run marginal costs and long run marginal costs.

Short run marginal cost (SRMC) is the additional cost associated with increasing production by one unit, in a period in which at least one factor of production is fixed. In water, this would be the direct costs of treatment and supply, maintenance costs required to ensure supply, and environmental and other external costs.

Long-run marginal cost (LRMC) is the cost of providing an extra unit of the service when all production costs are variable and, where future augmentation is anticipated, includes a component for the capital costs of expansion.

An important characteristic of such an approach is that it increases as the time of the next augmentation nears. This is because the present value of the imminent augmentation will be higher than if the same augmentation were more distant.

LRMC incorporates the cost of known capacity augmentation.

The calculation of LRMC on this basis requires consideration of the cost and timing of capacity augmentation, and the impacts of an assumed permanent increase in demand. Total Management

[21] The use of utility prices as a means of redistributing income, or for vertical equity reasons, has been criticised on the grounds that such approaches lack transparency and are sometimes poorly targeted. Critics suggest that 'social' objectives are best accommodated through general government taxation and welfare programs.

Plans (TMPs),[22] which are used by a number of local governments for their water and sewerage businesses, are likely to contain much of the basic data needed to calculate the LRMC.

The LRMC for a water business may be difficult to determine where competition is anticipated in the future.

Long Run or Short Run Marginal Cost

There are differing views on whether SRMC or LRMC is most appropriate.

There are differing opinions on which approach to adopt:

- the Bureau of Industry Economics (BIE 1995) supported short run marginal costs as the relevant benchmark for setting efficient prices, as such costs reflect the incremental (opportunity) costs of supplying an additional unit of output to the next user;

LRMC is adopted by other agencies and regulators.

- in Queensland, there is significant support for the use of LRMC for the volumetric component of a two part tariff for water services. The Department of Natural Resources' Guidelines for Two Part Tariffs, for example, advocate the use of LRMC, as do the related guidelines for the identification and disclosure of cross-subsidies. LRMC also has been accepted as the appropriate cost measure by regulators in Victoria and by Ofwat in the United Kingdom;

- London Economics (1997) contend that the difficulties of measuring congestion costs accurately combined with the instability of SRMC reinforces the view that LRMC is a preferable concept as it ensures stable financing of long term investment. However, they recognise that LRMC is difficult to measure;

- King & Maddock (1996) argue that LRMC pricing does not eliminate the requirement for rationing when demand is at network capacity, but simply prevents price from being the rationing device. They conclude that there is no reason why LRMC pricing will be efficient; and,

- Ng (1987) notes that SRMC pricing leads to allocative efficiency, and argues that it need not lead to a financial deficit on the part of the water supply business. However, if cyclical price changes are large, SRMC pricing alone may not be politically feasible. Ng suggests price fluctuations could be reduced by adoption of a two-part tariff, in which the access charge is varied in the opposite direction to the unit price.

Underlying many of the concerns with SRMC is the instability in

[22] TMPs cover matters such as service levels, financial management, development of asset registers, implementation of renewals and maintenance programs, and ongoing evaluation of asset condition and performance. TMPs are required by the Queensland Government for local government water businesses where these seek to access State grants and other forms of funding support.

pricing which becomes particularly evident when capacity constraints are encountered. Usage charges determined under LRMC pricing would generally be less variable over time than SRMC pricing as the incorporation of the net present value of future augmentations would result in prices rising well in advance of infrastructure capacity constraints. Prices based on LRMC more effectively signal impending infrastructure constraints and therefore are more relevant to the more effective use of water and provide more effective signals for the planning of future augmentations.

In practice, estimation of the long run marginal cost can be difficult and it is usually estimated by computing the cost of increasing supply by the next most economically efficient discrete augmentation possible. This is represented by the term incremental cost and it is then averaged for each unit of supply. However, as discussed further below, with respect to postage stamp tariffs, an issue arises as to whether the average should be determined for the entity or for different customer groups.

A number of factors may affect the determination of LRMC. One issue is that LRMC should reflect the potential for deferral or modification of capacity augmentation through the adoption of demand management strategies (low-flow shower heads, rainwater tanks, dual flush toilets etc) and water recycling options. These strategies may in fact feature in the determination of LRMC where they involve changes in capital and operating expenditure. Another issue is the effect of competition. The LRMC of a particular business may be difficult to forecast if competition is anticipated.

The Authority prefers LRMC.

The Authority generally considers that LRMC:

- provides a better signal to consumers in terms of the long term costs of supply, recognising that current consumption does have impacts on future costs; and

- ensures that customers pay the full costs imposed by their demand where the costs include all investment consequences of increased demand as well as impacts on marginal operating costs.

Regardless of whether LRMC or SRMC is adopted, where supply is constrained by the hydrology of the catchment, some additional allowance may need to be made for the associated scarcity of water.

Fixed and variable costs of water service delivery can vary substantially in peak demand periods.

Peak Price Differentials

Where urban water demands are not spread evenly over time, there may be substantial temporal differences in costs of supply. Peak demands drive system capacity requirements, and therefore

impact on the magnitude of both fixed and variable costs.[23] In some systems, peak day demands are more than double average daily consumption. For Brisbane Water and Gold Coast Water peak day demands are approximately 44 and 39 per cent respectively above average[24] (WSAA 1998), effectively requiring network capacity to be substantially greater than would be required if demand was constant through time.

Peak pricing should reflect LRMC and off-peak SRMC

Allowing for prices to vary in reflection of such underlying cost differentials can provide benefits in terms of smoothing peak demands, with consequent reductions in system capacity requirements (OECD 1999a). In general, peak prices should be structured to reflect the LRMC of supply (including relevant opportunity costs relating to congestion etc), with off-peak tariffs, assuming off-peak demand does not contribute to peak capacity requirements, reflecting only the SRMC of supply (Campbell 1999).[25]

Peak pricing is common in other utility and service industries, including telecommunications, electricity (for hot water services), air travel and accommodation bookings and even video movie rentals. In these industries, it is clear the consumers both accept and understand that peak users are responsible for a higher proportion of business costs (or that price premia are needed to manage peak demand) and that prices reflect this.

Metering technology is a constraint on peak period pricing.

In practice, there are few examples of water tariffs that incorporate time-of-day or time-of-week consumption elements, principally because of deficiencies in current metering technology. There are, however, various international trials of more sophisticated multi-rate tariff meters and automated meter reading technologies which should, for larger urban water consumers at least, provide greater scope for more disaggregated tariff structures.[26]

Seasonal Price Differentials

Seasonal water demand should be reflected in prices.

Seasonal tariff variations, although rare in practice, also warrant further consideration for the urban water sector. The seasonal element in tariff structures generally is characterised by higher

[23] Network capacity also may be related to fire suppression requirements. Residential sub-divisions, for instance, are generally supplied through 150mm pipes to ensure sufficient supply and pressure for fire fighting purposes, with resulting capacity substantially in excess of any 'normal' peak demands.

[24] For Gold Coast Water peak daily demand accounts for 90 per cent of peak system delivery capacity (WSAA 1998).

[25] A number of water utilities employ increasing or rising block tariffs, where the volumetric charge increases with subsequent consumption blocks. Such charges commonly are argued on the grounds that a minimum level of consumption is essential for public health purposes, or that higher users should bear a greater share of system costs. It is not clear, however, why marginal costs would increase with higher levels of consumption by an individual consumer. Although costs do increase with peak usage, it does not necessarily follow that higher levels of absolute usage equate to greater peak responsibility. Also, non-discretionary water usage varies considerably by household size, and a concessional allowance may penalise larger households while provide incentives for inappropriate water use by smaller households.

[26] Peak pricing mechanisms also need to consider the potential for "peak shifting". Peak shifting occurs where peak demand responds to higher charges by falling to a level below that in the off-peak period. The extent to which peak shifting takes place obviously would depend on the price elasticity of the relevant consumers, and the magnitude of the peak price premia.

volumetric rates during the summer months. Westernport Water in Victoria, for example, employs a two part tariff in which the volumetric element is increased in summer months as a means of mitigating tourist-driven peak demand. The volumetric tariff increases to $1.00 per kilolitre for November-June, up from $0.60 for the remainder of the year.

In Tasmania, the Government Prices Oversight Commission has recommended that Hobart Water, the North West Regional Water Authority and Esk Water move to differentiated usage charges to accommodate seasonal cost variations (Government Prices Oversight Commission 1998). In the United Kingdom, two smaller water companies recently have introduced seasonal elements into their industrial (urban) tariffs, and are reportedly considering the extension of such tariffs to the residential sector in the near future (OECD 1999a).

Simplicity and Consistency

Pricing structures should be simple in order to minimise transaction costs.

Urban water pricing will be applied in a wide range of circumstances. The above principles do not imply identical price structures across all suppliers. The aim should be to devise the most efficient pricing structure for particular circumstances, while keeping transaction costs low. The structure should be easy to present and understand, and would need to cater for different scales of use.

In practice, precise determination of marginal cost may be difficult. However, a "best endeavours" approximation is likely to generate most of the benefits obtainable from this approach. Both the Industry Commission (1992) and the Government Pricing Tribunal of NSW (1993), now IPART, acknowledge that there is little benefit in attempting to go beyond a reasonable approximation of marginal cost.

Environmental Externalities

Costs of service delivery should include environmental externalities.

The ARMCANZ water pricing principles require that externalities (including environmental externalities) be reflected in costs, but only to the extent that these are addressed by a specific levy or similar procedure (for instance, through a catchment wide salinity levy).

Where the marginal consumption of water leads to environmental costs, usage prices should be increased to reflect these external costs, although it is recognised that there may be significant difficulties in this approach. The costs of environmental damages unrelated to incremental consumption should be reflected by adjustments to the fixed charge.

In the Australian Capital Territory, the Independent Pricing and Regulatory Commission (IPARC) has recommended that a water abstraction charge be levied, including a component of 1.5c/kL reflecting the costs of environmental and catchment management related to water usage. This charge is to be identified separately on consumers' bills, and the revenue remitted to the ACT

Government.

The Authority proposes to adopt the ARMCANZ approach to valuing externalities.

In general, and recognising the difficulties in identifying the impacts of water consumption on environmental values and measuring these impacts for costing purposes, the Authority would propose to adopt the ARMCANZ approach, although it would consider other arrangements on a case by case basis.

Setting An Appropriate Fixed Charge

Fixed charges will be required to ensure sufficient revenue for viable businesses.

The revenue raised from the usage charge may be sufficient in itself to ensure the water operator is viable on a continuing basis. However, this will usually not be the case and an additional charge will be required to ensure that sufficient revenue is generated. Whilst such a charge is often fixed, it need not necessarily be so. What is particularly important is that it be established in an as non-distortionary a manner as possible. Because of its acceptance in industry circles, the charge will be referred to as a fixed charge.

Allocation of Fixed Costs

Fixed or common costs need to be allocated between customer groups.

Setting the fixed charge essentially is an exercise in cost allocation – or allocating those unattributable 'fixed' costs that are not recovered through usage charges to particular users or classes or users. For the urban water sector, costs typically identified as 'fixed' would likely be considered common costs. These include:

- the cost of network assets which provide a common service; and,
- the cost to the service provider of providing non-asset related services to users.

Common and fixed costs are likely to arise in all components of the urban water sector, although they are particularly prevalent in the provision of distribution or reticulation services. For example, water distribution assets that may give rise to common costs include:

- distribution pipes that service more than one customer;
- communication systems;
- network meters at junctions between bulk transfer facilities and reticulation systems;
- fixed assets such as buildings and land that are not associated with any particular user (eg, head office buildings); and,
- maintenance and overhead costs related to assets such as motor vehicles and construction equipment.

There are a number of non-asset related common costs.

Various non-asset related common costs also may exist, including:

- administration and management expenses;
- data collection and publication;
- emergency services;
- maintenance services;
- billing systems;
- system leakages[27]; and,
- network planning and development.

Alternative Approaches to Setting Fixed Charges

Approaches for allocating fixed costs include…

There are a number of approaches that may be applied to allocate common or fixed costs across services or users, including:

- *fully distributed costs*[28] - where non-attributable costs are fully allocated, according to formulas such as the fraction of total output, in proportion to the costs that can directly be attributed to a user/service or in proportion to the revenues generated;
- *demand measures* - where fixed costs are allocated to consumers considered most likely to be able to bear these costs. For instance, the National Third Party Access Code for Natural Gas Pipeline Systems provides for 'prudent discounts' which allow for fixed costs to be reduced or not attributed to a particular user on the grounds that the user may otherwise not accept the relevant service (ie, disconnect or bypass the network);
- *land value* - historically, land value has played a significant role in water pricing and, for some water businesses, is still used as a basis for setting fixed charges within a two part tariff structure. Under this approach, fixed charges are highest for those consumers with higher land values – reflecting the perceived capacity to pay of the consumer. However, concerns regarding the efficacy of this approach – and particularly the link between land values and ability to pay – has resulted in most water businesses de-coupling water charges from measures relating to land value;

[27] Unaccounted for water was discussed above.

[28] In allocating fixed costs, of course, assumptions need to be made regarding the likely number of consumers connecting to the network. For mature water businesses with relatively stable demand, or where growth is relatively predictable, this should not be of concern. Indeed, even for other water supply businesses, the essential need for water should ensure that customer numbers are not subject to wide variability over reasonable periods of time.

- *peak usage responsibility* - Kahn (1995) noted that the issue in determining the basis for fixed charges is not the potential or even the average usage, but each user's proportion of consumption at the system's peak. A commonly used proxy for peak usage is to link the fixed charge to the diameter of the pipe or meter serving the property.[29] This technically relates only to the potential maximum usage and, in the absence of time-of-use metering, may not accurately reflect actual usage at times of peak demand. Also, where larger meter connections are required for purposes other than expected demand requirements (eg, for fire services purposes), meter size may again be a poor proxy for the consumer's likely demand characteristics.

  However, a competing argument in support of using meter sizes as the basis for fixed water charges is that, even if a consumer uses no water, the water business has an obligation to supply and the customer therefore should pay for the option of 'reserving' use of the network; and,

- *self-selecting tariff schedules* – these allow customers to choose from more than one pricing scheme so as not to discourage connection (or encourage disconnection). In their simplest form, consumers may choose between a low fixed charge/high volumetric charge (exceeding LRMC), or a standard (higher) fixed charge and lower usage charge. Consumers with low demands that otherwise may have been discouraged from connecting because of the fixed charge could then elect to pay a lower fixed fee, but face a higher usage charge. Self-selecting tariff structures are common in the telecommunications sector, particularly for mobile telephony, and could offer advantages for the urban water sector in some cases.

For gas distribution, common costs frequently are allocated according to the maximum hourly quantity (MHQ) consumed and peak usage, recognising that distribution system costs largely are driven by the maximum peak demand. For smaller consumers where MHQ metering is not available, fixed costs commonly are averaged across consumers.

For most (domestic and commercial) water consumers, existing metering would not support allocation of fixed costs against MHQ/peak usage and in practice costs often are allocated according to a proxy such as meter size.

London Economics established four basic equity and efficiency principles for allocating fixed costs.

In a report to the Government Prices Oversight Commission of Tasmania, London Economics (1995) established four general principles for allocating fixed costs that may assist water businesses in developing fixed charges:

[29] The Department of Natural Resources' *Guidelines for the Evaluation of and Improving Two Part Tariffs* adopts this approach.

- identical customers should bear the same costs;
- customers should not be charged more than the service is worth to them, or else the market will be distorted by disconnections;
- charges must be based on an observable characteristic of the customer; and,
- continuity of charging policy is important for public and political goodwill – any changes in charges to different customer groups can create customer discontent.

Constrained Market Pricing

Fixed charges should be set to avoid bypass by customers of the existing system.

In considering the appropriate fixed charge, also relevant are the incentives created for bypass of the existing system, or for disconnection by consumers who would be prepared to pay at least the marginal costs of consumption, but not a 'full' contribution to fixed/common costs.

Care needs to be taken to ensure that the fixed charge does not lead to the exclusion of some consumers from the network. For example, if the fixed costs were simply to be divided equally among consumers, then some of those potential purchasers may be pushed out of the market. However, the Tasmanian Government Prices Oversight Commission (1998) noted that the lack of substitutes meant there was very little possibility that the imposition of a fixed charge would lead to consumers choosing to disconnect.

Stand-alone costs define an upper limit in constrained market pricing - above which customers would disconnect.

Constrained market pricing refers to the pricing band between stand-alone costs and incremental costs within which utility charges must lie - irrespective of the approach taken to the setting of fixed charges. Charges set beyond stand-alone cost promote disconnection from the network and investment in alternative supply. The stand-alone cost for residential water users could potentially be the cost of purchasing and installing water storage tanks, while for industrial users stand-alone costs may be determined by the costs of re-using water on-site.

7.5 Other Issues

Postage Stamp Tariffs

Postage stamp tariffs involve the adoption of uniform fixed or variable charges for all customers.

A number of urban water utilities throughout Australia and Queensland levy uniform charges on all users (or all classes of users) within their supply area, often referred to as postage stamp tariffs. For example, a utility may levy a two part tariff for water supply which has equivalent fixed and variable components for all domestic consumers.

Postage stamp tariffs are likely to be most appropriate where:

- shared network costs benefit all users;
- there are equity concerns regarding locationally-

differentiated charges; or

- there are difficulties in identifying and measuring cost differentials between sub-network areas (London Economics 1999).

Prices that reflect cost differentials involve higher administration costs.

Where costs of supply differ between consumers (whether by geographic area, consumer class etc), efficiency would be enhanced where prices reflect these cost differentials. However, there are administrative costs in terms of structuring and implementing a charging regime which recognises such cost variations. Complex pricing structures also may be less readily understood by consumers, with consequent community opposition to pricing reforms.

Nodal pricing applies different charges to areas of a network.

A practical compromise, particularly applicable to larger water supply schemes or for large consumers, is nodal pricing, where prices vary for defined separate parts of the supply network based on substantial and identifiable cost differentials. Nodal pricing may involve both the fixed or volumetric components of a two part tariff varying between areas, depending on the particular cost characteristics of the network.

Hunter Water, in its submission to IPART for the 2000-2004 Medium Term Price Path, has proposed a tiered pricing structure, incorporating a lower water usage charge for very large (>50 000kL per annum consumption) consumers that also varies to reflect the cost of servicing different locations (Hunter Water Corporation 1999).

The Authority is predisposed to charges that reflect cost differences.

In general, the Authority would be predisposed towards tariff structures that reflect identifiable and substantial differences in costs of supply between consumers, consumer classes, or geographic areas. The Authority would need to consider in the context of an investigation or arbitration, the specific circumstances that may apply, including the costs of obtaining the necessary information, the disadvantages of a more complex tariff structure and the likely efficiency gains that may result from a more cost-reflective pricing framework.

Community Service Obligations

CSOs are non-commercial activities performed at the direction of Government.

Community service obligations (CSOs) refer to activities undertaken by (State or local government) businesses which:

- arise because of a direction from the parent government; and,
- would not be performed for commercial reasons.

In the water sector there are different types of CSOs, including:

- delivery of services to final consumers at uniform prices;
- delivery of services at no charge or below full cost;

- price concessions to particular consumers or groups of consumers; and,

- requirements that the business source inputs from preferred (uncommercial) suppliers.

The regulatory implications of CSOs largely relate to how these should be specified and costed, and accordingly how they impact on regulated prices.

Treasury has concluded that avoidable costs are the best measure of the costs of delivering CSOs.

Options for costing CSOs were considered by Queensland Treasury (1996), which concluded that:

> While *marginal cost pricing* best reflects the opportunity cost of producing a CSO and therefore represents the most efficient form of CSO costing, it is difficult to estimate in practice. *Stand-alone costing* is generally not an appropriate approach as it results in an overestimation of costs. Similarly, *the fully distributed cost method* tends to overestimate the costs of CSO provision and does not reflect the causality between cost increases and the supply of additional services.
>
> The *forgone revenue approach* is intuitively attractive because of its simplicity, but will generally only be appropriate where the market for service provision is highly competitive or contestable. While difficult to apply, *avoidable costs* are likely to come closest to measuring the true costs associated with delivering a CSO through a public enterprise. However, different costing methods may be appropriate in particular circumstances.

Avoidable cost is based on the longer run increment in costs imposed by a CSO, and therefore maintains the causal link between increases in output and price. The difference between avoidable cost and fully distributed cost lies in the treatment of joint and common costs. While the avoidable cost approach includes only costs that would be avoided by not providing the additional service, the fully distributed cost method allocates some part of unattributable costs to the CSO.

The Authority considers that, in general, it is inappropriate to include non-attributable costs in CSOs, as their inclusion could lead to under-pricing of, or excessive returns on provision of, non-CSO services, which in the absence of the CSO-related services would bear the non-attributable costs in full. This could result in a monopoly business charging non-competitively neutral prices for contestable services. However, in the case of a natural monopoly, there may be grounds for recovering some non-attributable costs through CSOs.

Queensland Treasury's most recent CSO policy framework (Queensland Treasury 1999) does not address the question of costing method. However, the Queensland Government has previously used the long run avoidable cost method for costing rail and electricity CSOs, and has specified its use for the community service obligations of its commercial business units.

Funding based on efficient avoidable costs will provide an incentive for improved performance.

As an incentive for improved performance, funding for provision of services, including through CSOs, should normally reflect the efficient avoidable costs of supplying the service, rather than

actual costs where these reflect inefficiency.

Cross-Subsidies

The removal of cross-subsidies between consumer groups is a desirable outcome of efficient tariffs.

Cross subsidies may exist between services and/or consumers or groups of consumers. Identification and removal of cross-subsidies is not a direct objective of the existing or proposed regulatory framework, although it is a necessary and desirable outcome from establishing efficient water tariffs. The relevant COAG agreements suggest that cross-subsidies should be removed, though where they are retained, they are to be made transparent.

Two approaches to the identification and measurement of cross-subsidies…

The scope and magnitude of cross-subsidisation depends on how a cross-subsidy is defined. Broadly, there are two approaches to the identification and measurement of cross-subsidies.

- *incremental approach* – under this method, a cross-subsidy arises only where a service provider receives less than the incremental cost for providing a particular service, and other customers pay in excess of their stand-alone costs of supply; and,

- *cost allocation approach* – under this approach fixed costs are allocated according to some predefined formula for each service, customer or customer group (such as volume, capacity share etc), and cross-subsidies are deemed to exist where prices deviate from these cost benchmarks. Although generally simpler than the incremental approach, the costs derived do not necessarily have any relevance in terms of the efficient cost of delivering the service, and may result in prices either below incremental cost or above stand-alone cost.

Guidelines for the identification and measurement of cross-subsidies for local government water and sewerage businesses specify a test related to the LRMC. A cross-subsidy is deemed to exist where one consumer pays a total charge more than LRMC, and another pays less than this cost. This definition is similar to the incremental approach above.

An efficient two-part tariff will eliminate cross-subsidies.

In general, adherence at the customer group level to the pricing principles proposed by the Authority would eliminate cross-subsidies, as defined by the incremental approach.

Unpriced Water Allocations

A common practice among local governments is for volumetric charges to apply only to usage above a specified 'free' allowance.

Many local government water businesses provide an allocation, in some cases up to 1 200kl per property, before volumetric charges ('excess water' charges, if any) are applied. The inefficiencies resulting from 'free' allocations will be greater the larger is the quantity of water provided 'free' and where fewer consumers face excess water charges. In a sense, the term 'free' is a misnomer as the costs are merely transferred to other units of consumption, either the generally applicable water rates charges or other

consumers.

Where consumption is at or below the level of the allocation, consumers face a zero marginal cost of consumption and have no price incentive to conserve water or to evaluate whether the benefits from water use actually exceed the costs of supply.

The NCC has expressed concern at the use of free allowances.

The National Competition Council, in its assessment of State and Territory implementation of COAG water reform requirements, has expressed concern at the continued use of free water allowances. In respect of Tasmanian water businesses, the Council is understood to have indicated that it considered 50kL per year per household to be an acceptable level for free water allowances. Allowances above this were potentially inconsistent with the principles of consumption based charging and with the general objectives of tariff reform. The Council generally prefers that free water allowances be avoided to reduce the risk of cross-subsidies and to maximise the water use incentive from consumption-based charging.

Water Charges for Flats and Units

For some local governments, the proportion of commonly metered domestic flats and units is significant.

For some water utilities, a large proportion of water is used by residential consumers in flats or units that are not individually metered. Unmetered domestic strata title units in the Gold Coast, for example, make up 37 per cent of the 170 000 properties serviced by Gold Coast Water, though they account for only 16 per cent of water consumption (Gold Coast City Council 1997).

Complexes of flats or units typically have a common meter. Indeed, the plumbing configurations of many existing apartments cannot support individual metering, nor would retro-fitting of such meters (where possible from an engineering perspective) be economic. Even where new developments are required to incorporate discrete meters,[30] there remains the problem of dealing with existing flats and units, and the perceived degree of equity in terms of the relative treatment of each.

The absence of individual metering limits pricing options. In practice, water utilities usually average the supply (volumetric) charge between individual users, and levy either a separate service charge equivalent to that faced by a standard household (ie, based on a 20mm meter connection), or average the fixed charge that applies to actual connection. The latter option can raise equity concerns in that group title residents may end up paying more (or less) than a standard connection fee.

These issues obviously would need to be considered by the Authority in the context of the relevant pricing dispute or investigation.

[30] Community consultation by Gold Coast City Council revealed a strong preference for new unit developments to incorporate individual meters. Council's Water Pricing Advisory Committee noted also that advances in remote meter reading technologies could address any perceived concerns in terms of the reading of individual meters for billing purposes. Costs of retro-fitting meters to existing flats and units were estimated at in excess of $20 million.

Unmetered Connections

Unmetered connections should be given the option of installing a meter.

Unmetered connections typically are charged using an implied average consumption level. This may lead to concerns where actual usage is below or above average.

Consumers with unmetered connections should be given the option of paying for the installation of a meter, thereby allowing them to access any expected savings in terms of reduced water (volumetric) charges. This would be consistent with the treatment of new properties in that these are generally required to meet the costs of meter installation at the time of construction.

7.6 Summary of Principles

Two Part Tariffs

Where prices need to be set, they should reflect long run marginal costs. In most circumstances, two-part tariffs will provide the most appropriate approach to ensure revenue adequacy.

In some circumstances, specific prices will need to be established. These should be based on long run marginal costs. However, where such prices do not achieve revenue adequacy:

- *two part tariffs* will best meet the objectives of efficient pricing, cost recovery and equity for most urban water businesses;
- *volumetric charges* in a two-part tariff generally should be set to reflect the long run marginal cost (LRMC). In practice this would involve the estimation of an average incremental cost;
- the *fixed component* of a two part tariff should be set to recover any revenue shortfall (after the application of volumetric charges), and structured so as not to encourage bypass or disconnection from the network;
- *postage stamp tariffs* may be appropriate in some circumstances, but where costs of supply differ substantially between areas or consumer classes, efficiency would be enhanced where prices reflect the underlying cost differentials. The administrative efficiency and social impact of such a change would also need to be considered; and,
- *CSOs* relevant to water businesses should generally be costed using the avoidable cost method.

Pricing Water

In some circumstances, the price of water, as distinct from the cost of infrastructure services, will need to be estimated.

Delivered water prices effectively represent (at least) two separate components – a price for the infrastructure services associated with its treatment, transmission and distribution and the cost of the resource itself.

- where there exists unmet demand as a result of either hydrological or infrastructure constraints a value may need

to be ascribed to the water resource. This is often referred to as the scarcity value; and,

- this scarcity value may be estimated by reference to prices in a relevant *competitive market* for water property rights or by other means.

8. INCENTIVE STRUCTURES

8.1 Regulatory Incentives

Price or revenue caps are usually applied in conjunction with incentive mechanisms such as CPI-X.

Price and revenue caps are generally applied in conjunction with incentive measures designed to provide rewards and penalties to encourage a regulated entity to achieve certain desired goals (such as low costs of production) while providing the entity with some discretion in achieving those goals (Lewis and Garmon 1997).

The most common mechanism associated with incentive regulation is CPI-X price (revenue) revisions, where X is a pre-determined index reflecting the perceived capacity of the regulated business to realise cost savings. Where the business is able to deliver real cost savings in excess of X, it is able to retain the additional funds generated for some period.

The X Factor

The X Factor may be a general efficiency factor not linked to costs (unlinked) or it may be cost-linked.

The X-factor may be set using an independent measure of efficiency (such as total factor productivity), not directly related to the entity's operating costs. This approach, sometimes referred to as "unlinked", provides strong long-term incentives to firms and lowers the informational requirements of the regulator. At the extreme, unlinked incentive regulation dissolves any direct relationship between costs and regulated prices.

Alternatively, X may be set with reference to the individual characteristics of the regulated business, and its unique capacity to reduce or contain costs. Ofwat, for instance, uses a form of "cost-linked" incentive regulation, with individual estimates of X for each regulated water and water and sewerage company.

In setting the appropriate value for X, it is important to recognise that the index will apply to the entire maximum revenue requirement, which includes both capital and operating cost components. X therefore needs to reflect the business' capacity to realise real savings in total, not just in terms of its operating expenditures.

Other relevant issues include:

The X Factor will need to be considered in terms of the impact on the business and its customers.

- the capacity of the regulated organisation to reduce costs without compromising customer service quality requirements;
- the opportunities available to the regulated organisation to increase the value of its business;
- the advantages and opportunities to encourage growth in the market;
- the ability of the organisation to finance its operations;
- the impact of asset valuation approaches, in particular the

impact of optimisation, on realistic productivity improvement capabilities; and,

- desired transitional paths, eg. to allow a period of adjustment to new rates.

The Appropriate Cost Index

The CPI is readily available but may not be relevant for water industry cost changes.

Traditionally, Australian utility regulators have adopted the Consumer Price Index (CPI) as a basis for price/revenue cap escalation over the regulatory period. The CPI is readily available, widely understood and it sufficiently broadly based that the actions of any regulated business cannot affect it.

However, the CPI was not designed for utility regulation, and is based on a representative basket of products and services for household consumption. The CPI may therefore bear little resemblance to actual cost changes relevant to the urban water business.

.

For electricity distribution businesses, although the CPI is used in jurisdictional regulatory price/revenue determinations, there is growing support for the use of some industry average cost index. A difficulty with industry-based cost indices is that, being more narrowly based, they are potentially more variable on a year-to-year basis than CPI.

The Authority, at least initially, prefers to adopt CPI.

In general, the Authority would propose, at least initially, to use the CPI for price/revenue escalation as part of an incentive regulation mechanism.

Glide Paths

Incentive regulation requires consideration of how efficiency gains should be shared in the future.

Incentive regulation involves consideration as to how the regulated entity and consumers should share the benefits from unexpected 'out-performance' of regulatory cost benchmarks. Most regulators maintain a consensus that there should be no 'clawback', so that the entity should retain in full any benefits from improvements in productivity at least up to the next price review.

Consideration is then given to how such benefits should be shared in the future, and whether price adjustments should be made on a reducing basis over time, commonly referred to as a 'glide path', or passed through to consumers through one-off adjustments, which commonly are referred to as P_0 adjustments.

Cost gains may be passed through to consumers either entirely by a full glide path or partially through a partial glide path.

Under a glide path cost improvements are passed on to consumers either entirely (full glide path) or partially (partial glide path) over time, thereby allowing the regulated business to realise benefits of efficiency gains for a period beyond the next regulatory review. The full glide path approach has been accepted by IPART for revenue regulation for NSW electricity distribution businesses, and supported by NSW Treasury for application to urban water sector regulation.

A recent development in the United Kingdom is the proposal that efficiency improvements be 'rolled forward' for five years, allowing regulated water and water and sewerage companies to gain the benefits of any unexpected efficiency gains for a full five years, irrespective of where in the regulatory cycle these occur.

The Authority prefers not to engage in excessive regulatory intervention by categorising the source of cost improvements.

Some regulatory jurisdictions advocate that exogenous cost-improvements (ie, those arising from external, uncontrollable factors) should be passed immediately through to consumers, and argue that to do so should not compromise longer term efficiency incentives. However, such approaches require significant regulatory intervention in that all relevant cost and revenue impacts need to be categorised as either controllable or uncontrollable. At the extreme, this could result in regulatory micro-management of the entity, and for this reason this approach is not supported by the Authority for application to the water sector.

Cost Pass-Through

A further consideration is how unexpected cost increases should be accommodated.

In addition to sharing unexpected benefits from efficiency improvements, regulatory mechanisms need to accommodate unexpected (exogenous or otherwise) deteriorations in costs.

Ofwat, for example, allows for utilities to pass-through the costs of increased compliance costs arising from European Union-mandated quality standards through its RPI±K formula. In Australia, the ACCC allows 100 per cent pass-through of those direct costs relating to Government-mandated airport security requirements (ACCC 1998b).

Cost pass-through arrangements may have unintended and undesirable impacts on regulatory incentives. For example, if the regulatory regime permits one category of costs to be automatically passed-through to consumers, there may be a bias towards this expenditure at the expense of any appropriate substitute.

Cost pass-through mechanisms should be designed to avoid windfall gains or losses.

One approach, which has been used in Australia for electricity distribution businesses, is to define *ex ante* generic "pass through events". Such events could include changes to taxes, required service standards or other legislative requirements and these would provide a trigger for the regulated entity to apply to the regulator for additional costs to be passed through to consumers. The suitability of this approach would need to be considered in the context of the relevant regulatory circumstances. Any 'pass-through' mechanism would need to be designed to avoid undue windfall gains or losses to the regulated business.

Quality Standards

There is a risk that water service providers will reduce costs by reducing service standards.

Under all forms of financial regulation of monopolies, there is a risk that the regulated business may try to reduce costs and hence increase profits through reducing the quality of services offered to users. The role of the economic regulator is not to pre-empt quality or customer standards. Rather, it is to recognise that

different standards may have differing implications in terms of the costs of supply, and to recognise this in relevant regulatory determinations. An imperative is that good communication is maintained between economic (the Authority) and non-economic regulators.

'Non-economic' regulation of water services providers currently is undertaken by a number of agencies, including the Department of Natural Resources, Department of Communication and Information, Local Government, Planning and Sport (for local government water services providers), the Environmental Protection Authority (EPA) and Queensland Health.

Under the *Health Act 1937*, Queensland Health is the responsible agency for public health matters, including drinking water standards. At an operational level, much of the responsibility for maintaining public health standards rests with the water providers (principally local governments), and these providers are encouraged to adopt a risk management approach to operational procedures for the delivery of drinking water (Queensland Water Reform Unit 1999). These procedures are to be based on the *1996 Australian Drinking Water Guidelines*.

Under proposed amendments to Queensland's water resources legislation, water providers would be responsible for defining and documenting service quality standards, such as in relation to interruptions to supply, pressure and flow. Recognising the desirable and necessary variability between users, uses and regions, it is currently not intended that the Department of Natural Resources (the responsible agency for this legislation) would specify absolute minimum standards on these matters. Separate from service quality standards, water providers also would be required to establish customer service standards covering matters such as billing and metering arrangements. These standards may be tailored for individual consumers and provided they are relevant to the needs of consumers, will be acceptable to the Authority.

Period of Regulation

The regulatory period must be long enough to allow new initiatives to be implemented.

In order to achieve efficiency gains, the regulatory period must be long enough for management initiatives to be implemented and take effect. The period must also be long enough to discourage measures to improve the profitability of the business in the short term at the expense of longer term considerations. For example, sharp reductions in system maintenance would increase the profitability of an urban business in the short term, but at the expense of system degradation and risk of failure.

Longer term objectives, such as more efficient network operation and utilisation, must be allowed a sufficiently long period to return benefits during the regulatory period. The extent to which benefits are rolled into the next regulatory period through benchmarking or 'glide paths' in price adjustments will have an important impact on incentives and risks.

Efficiency gains made during the regulatory control period (over

and above that reflected in the X factor) may be shared by owners and users at the end of the regulatory period, or during the following period. Again, the nature of the sharing mechanism will affect the amount of incentive provided to achieve efficiency gains, particularly those gains arising from 'out-performance' of the regulatory incentive regime.

Generally, the longer management is able to retain the benefits of increased efficiency in the business through higher profits, the greater the incentive to pursue those initiatives but the longer customers must wait to share in the benefits.

The Authority prefers a regulatory period of 3 to 5 years.

In summary, the Authority considers that regulatory periods of between 3 and 5 years provide greater incentives for efficiency improvements and for realisation of longer-term objectives.

Regulatory Risk

The regulator must remain committed to its revenue or price cap decision.

A major issue in incentive regulation is the commitment by the regulator to its revenue or price cap decision. Laffont and Tirole (1993) for instance, argued the importance of the regulator's commitment to the "regulatory bargain" if the efficiency benefits of incentive regulation are to be achieved. Indeed, where the regulator introduces a new element of uncertainty, in terms of whether it will sustain its commitment to a defined regulatory compact, this may create additional risk and alter businesses' assessment of the expected market return from investment.

The regulator will need to ensure that the water businesses have sufficient incentive to introduce cost efficiencies.

Clearly, repeated confiscation of the benefits of efficiency improvements (from water businesses to consumers), combined with uncertainty as to future regulatory actions, will contribute to lower incentives for cost reductions and can even *increase* the costs of service provision (by translating into a higher required cost of capital).

Equally, the regulator and regulatory framework are not underwriters of operating risk. Should conditions change to the detriment of the regulated business, it should not automatically be expected that regulatory arrangements would be re-opened.

In some cases, it may be appropriate to define material events to trigger a review of regulatory arrangements, for it is not in the consumers' interests to see a regulated business driven to financial hardship by a regulatory decision premised on information that later proves to be substantially incorrect. In the United States, for example, regulatory rate cases frequently include 'off-ramps', or circumstances in which the regulated business may seek (and in other cases is obligated to seek) a reconsideration of the basis for regulated prices or revenues. Such mechanisms can help reduce concerns in relation to regulatory risk, and ultimately benefit both the consumer and the regulated supplier. These are analogous to the "pass through events" discussed above.

8.2 Implications for Water Utilities

Water utilities will need to meet the challenge of a regulatory environment.

Responding effectively and successfully to the proposed regulatory environment will present a challenge for some water businesses. Key issues for all water businesses potentially subject to prices oversight or third party access include the need to:

- develop sufficient accounting separation within vertically integrated operations;
- unbundle prices, at least internally, to include charges for bulk water, transmission, treatment, reticulation, metering/retail functions etc, as appropriate; and,
- identify appropriate cost drivers (eg, distance, customer density, peak volume, actual volume, geographic factors, economic and physical characteristics of assets) for pricing purposes.

Without pricing reforms, and particularly addressing uniform charges in the face of substantial cost variations, prices oversight and third party access could result in water utilities losing their most profitable customers – most likely to be large industrials. Competition may also emerge in supply for 'aggregated' demands (such as groupings of smaller commercials) and for 'fringe' or border developments potentially serviced by two adjoining networks.

Even where cost variations are not significant enough to warrant disaggregated tariff structures, the presence of cross-subsidies between services, users or classes of users is likely to provide fertile ground for complaints against monopoly pricing practices. A priority for water businesses should be redressing such cross-subsidies.

Water businesses can pre-empt access or pricing disputes by seeking undertakings.

Some water businesses may perceive advantages in pre-empting pricing or access disputes by seeking pricing or access undertakings, respectively. Such undertakings may provide benefits to the extent they are able to confirm or otherwise the appropriateness of different charging arrangements, tariff structures or methods. Seeking a pricing or access undertaking may also demonstrate to consumers that a water business is keen to respond to potential consumer concerns, outside of the potentially adversarial climate of a dispute.

8.3 Summary of Key Principles

The maximum revenue requirement will need to be augmented by measures designed to ensure ongoing efficiency.

Incentive measures are a key element of any effective regulatory regime. Appropriately constructed and applied incentive regulation can encourage efficiency improvements and ensure that, over the longer term, consumers and the regulated business are better off. The Authority's general approach is that:

- consistent with current regulatory practice, *CPI-X* price or revenue adjustments should be adopted during the

regulatory period;

- gains through out-performance of regulatory benchmarks should generally be passed through to consumers using a (full) *glide-path*, or through a once-off adjustment at the commencement of the subsequent regulatory period;

- *unforeseen changes* in the business' operating environment (such as changes in taxes or increased statutory quality requirements) should be accommodated by defining relevant trigger events and appropriate cost pass-through arrangements;

- different *quality or customer standards* should be recognised in regulatory determinations; and,

- *regulatory periods* of 3-5 years should be adopted initially to provide greater incentives for efficiency improvements and for realisation of longer-term objectives.

9. ISSUES FOR RURAL WATER PRICING

9.1 Pricing Principles

The general pricing principles apply equally to rural water suppliers.

The pricing principles outlined in Chapters 3 to 8 of this report are relevant to local governments, joint local government water supply boards and urban water boards. They are also relevant to rural-based water suppliers. These suppliers have a focus on providing water mainly for the irrigation industry, but may also provide bulk water for regional urban centres and major industries such as mining and power generation.

The purpose of this Chapter is to identify specific issues in the application of the Authority's pricing principles to rural water service providers, and in particular, those providing irrigation services.

9.2 Application of Pricing Principles to the Rural Water Sector

The main issues in the application of the pricing principles to the rural water sector are…

A key difference in the Authority's role in relation to the rural water sector is that the existing irrigation sector is subject to price paths by Government direction. Price paths have been implemented for entitlement holders served by SunWater to move cost recovery to the COAG minimum requirement[31].

Although the Authority does not have a defined role in monopoly prices oversight in the existing irrigation sector, it may be required to consider monopoly prices oversight issues in new irrigation schemes and pricing or third party access matters in joint irrigation/urban/industrial supply schemes.

Issues which affect the application of the pricing principles in these circumstances are:

- the determination of the maximum revenue requirement for existing joint irrigation/urban/industrial supply schemes, particularly where there is a wide disparity between cost recovery levels of customer classes;
- water entitlements which are held by irrigators are tradeable on a permanent basis, subject to local rules, providing a potential mechanism for revealing indicative values of water; and,
- some scope exists for differences in the way water prices are applied to irrigation, namely in terms of tariff structures, seasonal pricing and nodal pricing.

[31] The price paths cover the 5-year period from 2000 to 2004 inclusive. For a small number of irrigation schemes, the Government has established 6-year or 7-year price paths, through to 2005 or 2006.

9.3 Maximum Revenue Requirement

The maximum revenue requirement is not an issue where price paths are in place.

The maximum revenue requirement concept applies to the urban and industrial customer base of rural water schemes but is essentially not relevant for the existing irrigation customer base where price paths are in place.

Return on Capital

Regulatory Asset Base

For monopoly pricing purposes, deprival value remains the appropriate basis for asset valuation in rural water businesses. In instances of prices disputation for third party access, prices may need to reflect either the stand-alone cost of providing a particular service or, where there is significant excess capacity, the short run marginal cost (SRMC) of that service. In the latter instance, the valuation of the asset base may effectively be minimal.

Asset valuations are more complex for businesses where different services are provided by a single asset.

Asset valuations are more complex for a business where there are different services provided from a single asset and, in particular, where one customer group (the irrigation sector) is paying charges below those of other customers due to government policies. The basis for 'sharing' asset valuations between customer groups to reflect the effect of government policies will be a key issue in price-setting.

The sharing of infrastructure value will also need to recognise differences in the specification of services provided. For example, the irrigation sector typically receives medium reliability water while urban and industrial customers receive high reliability supplies. The provision of higher reliability supplies requires a greater share of storage capacity and, by inference, a greater share of asset value.

Therefore, in considering the appropriate asset base for pricing purposes, the Authority will need to give consideration to the differences between the urban/industrial and irrigation sectors resulting from the impact of government pricing policies, capital contributions and subsidies, and the quality of the service.

Contributed Assets

Contributed assets should be recognised and preferably included in the regulatory asset base but recognised for pricing purposes.

Contributions to the capital costs of rural water supply schemes, such as those administered by SunWater typically include specific contributions by mining companies, power stations and others to dedicated assets such as pipelines, pump stations and the like.

The Authority's preferred approach for specific arrangements or agreements by identifiable contributors to be recognised for pricing purposes is equally applicable to rural water businesses. Identified capital contributions should be included in the asset base, but be recognised by adjusting prices for those specific users in line with agreements made.

Where the level of individual contributions cannot be readily determined or where administrative costs of managing individual pricing arrangements outweigh the benefits, the Authority

supports the determination of an industry-based system of financial credits or price offsets, if it has been determined that it is appropriate to recognise the contribution.

Flood Mitigation Assets

Rural water storages may have been originally constructed to jointly provide flood mitigation and water supply services or may incorporate dedicated infrastructure for flood mitigation purposes.

The differential pricing arrangements between irrigation and other users add an additional layer of complexity to the issues of sharing these costs across users.

Return on Capital

Return on capital should be defined using a WACC.

The determination of a WACC for rural schemes will be necessary for establishing maximum prices for the urban and industrial customers of a rural water supplier, and for irrigation customers not covered by the Government's price paths. The WACC will also be required for third party access disputes involving customers of rural schemes.

The Authority's principles for the application of the CAPM to derive the return on equity component of the WACC remain relevant for rural water suppliers. In the case of existing schemes where price paths are locked in place for the irrigation sector, the Authority will need to consider whether there are any implications for the WACCs applicable to urban and industrial customers in the same schemes.

.

Where a WACC is determined for new irrigation businesses, the Authority's general principles will apply.

Operating Costs

Operating costs should be based on efficient costs…

The general principles require that operating costs be based on efficient costs. Operating costs include taxes or tax equivalents as well as externalities. In general, there is no difference in the application of the Authority's principles in relation to operating costs to urban and rural service providers.

However, there are two potential issues that should be considered in the application of the principles to rural water suppliers.

…and should recognise variability in service costs and product differences.

In the irrigation sector, there may be some variability in service costs from year to year reflecting variations in demand. The Authority supports the use of averaging methods or conversion to 'normal' year costs for general regulatory purposes.

The second issue is that fixed and operating costs will vary between customer groups where the water product, specifically the reliability of supply, differs. The allocation of costs between customer groups for pricing purposes will need to be on the basis of equivalent product, such as standard reliability, based on available hydrological information.

9.4 Pricing Rural Water – Scarcity Value

The value of the resource may need to be addressed in rural water pricing.

Where the Authority is required to oversight the delivered price of water, it may need to address the value of water as a resource as well as the infrastructure related costs of service delivery.

The scarcity value for water will arise where infrastructure or hydrological constraints result in increasing opportunity costs for water, forcing the value of water above the costs of storage, treatment (if any) and distribution. In the urban sector, the lack of a market means that scarcity values are presently not explicit. Scarcity values can only become apparent when water is made a tradeable commodity. However, water suppliers can incorporate the future cost of supply augmentation in determining their long run marginal cost for pricing purposes and in this way capture scarcity values.

Scarcity values in irrigation water may be revealed through traded water entitlements or the sale of new entitlements.

In the irrigation sector, there are two ways that water may be traded to potentially reveal scarcity values.

Queensland's *Water Act 2000* provides for Tradeable Water Entitlements (TWEs). Under the Act, existing nominal allocations will be progressively converted to TWEs as catchment based planning studies, Water Allocation and Management Plans (WAMPs), are completed. Once this process is completed, a market in water entitlements should develop. Water entitlements may be traded on a permanent or temporary basis[32]. Eventually, trading between industry sectors (eg irrigation, urban and industrial) will be permissible. The effectiveness of this market to reveal scarcity values will depend on the volume of trade and the level of market information.

Scarcity values in irrigation water may fluctuate substantially on a seasonal basis. The value of water temporarily traded to meet crop finishing requirements, for example, may exhibit significant scarcity values.

The second way in which scarcity values may be revealed is through the auctioning of new water entitlements. Scarcity values will be identifiable if auction bid prices for entitlements recover more than the infrastructure capital cost, on the basis that annual charges for water from the service provider would recover all other costs including externalities. The auction process has the potential to be a more reliable indicator of scarcity value due to the volume of sales, but is of course limited to the release of water made available through new development or improvements in specific areas.

Under a trading environment, service providers offering a bundled service (sale of water entitlements as well as delivery of water) may place a market-based scarcity value on either component. However, if the services are offered by separate providers, and the value of water entitlements is determined by a market process which includes a scarcity value, there is a need to

[32] Trading on a temporary basis is already in place in Queensland and a small percentage (1 to 2%) of irrigation entitlement is traded each year.

ensure that scarcity values are not subsequently also applied to delivery charges by the service deliverer.

Market values may reflect the value of subsidies such as those provided for irrigation services.

Market values of traded existing entitlements or new entitlements will reflect expectations concerning the delivery charges. The value of any government subsidies such as those provided through lower bound pricing for irrigation may be built into the market value. A value of a traded entitlement may therefore reflect the value of the subsidy rather than any scarcity value.

The Authority will need to examine prevailing arrangements to determine whether trading in water markets will provide indicative scarcity values. There is recognition that the practical determination of scarcity values may be limited by poor market information and thin trading in the case of traded entitlements and infrequency of releases in the case of new entitlements.

The Authority will seek to determine whether scarcity values are due to infrastructure or hydrological constraints.

The issue for the Authority will be to discern whether charges made by a service provider in excess of its maximum revenue requirement to incorporate scarcity values are justifiable, that is, whether they arise from genuine infrastructure or hydrological constraints and not from deliberate manipulation of water markets. If scarcity values are due to hydrological constraints, scarcity values should be based on the value of water in its next best use.

9.5 Two-Part Tariffs

Volumetric Charges - LRMC or SRMC

COAG lower bound does not explicitly include marginal capacity costs or scarcity values.

In the urban sector, the volumetric charge in a two-part tariff reflects long run marginal costs (LRMC) of an additional unit of supply while access charges are a residual to ensure that all costs are fully covered. LRMC is approximated by short run marginal costs (SRMC) plus marginal capacity costs related to the next expected future augmentation and includes externalities. COAG defines externalities to mean environmental and natural resource management costs attributable to, and incurred by, water businesses (eg as a result of salinity).

The LRMC approach is also preferred for the rural sector, but there are potential issues in its application. These issues relate to the following:

- the difficulty in establishing marginal capacity costs of augmentation due to the unpredictability of future demand;
- the greater significance of externalities in some cases, due to the environmental impacts of irrigation; and,
- in schemes where there are water shortages, there will effectively be an additional component in the price to reflect the increasing scarcity value of water. These scarcity values may be revealed through trading of existing entitlements or the sale of new entitlements.

The Authority proposes that these complexities be considered according to circumstances in the determination of LRMC for pricing purposes.

Fixed Charges

For the rural sector, fixed charges may comprise a large share of total charges.

The main issue in the application of two-part tariffs to the rural sector is that the need for revenue adequacy could mean that fixed charges comprise a large share of total charges. This is because irrigation water use can be extremely variable from year to year, in response to climatic and commodity market variations, with the result that there is a need to provide capacity to cope with these variations. Two-part tariffs with a greater weighting towards the access charge would maintain minimum revenues while encouraging either use of or transfer of underutilised entitlements. SunWater has also used three-part tariff structures[33] to address these issues.

Where there are water shortages, tariffs weighted towards consumption charges may encourage efficient water use.

In schemes where there are water shortages, tariff structures weighted towards consumption-based or volumetric charges provide an incentive for users to engage in efficient water use practices and to trade water saved through efficient use. In particular, predominantly volumetric charges may be appropriate for many of the State's sub-artesian groundwater resources that are under pressure. Volumetric charges may include tiered structures, or increasing blocks as a further incentive for efficient use.

On balance, the Authority considers that the structure of a two-part tariff in a rural scheme will depend on the characteristics of the scheme, including supply and demand conditions, climatic constraints and water supply reliability, variability in water use patterns from year to year and revenue requirements.

The Authority recognises that, in general, the minimum revenue requirement where water use is notoriously variable may require the application of two-part tariffs that generate a higher proportion of revenue from fixed charges.

9.6 Seasonal and Peak Period Price Differentials

Irrigation water use follows seasonal use patterns.

Irrigation water has seasonal use patterns and, as a result, infrastructure, particularly dedicated distribution infrastructure such as irrigation channels, is underutilised for periods of the year. By contrast, during peak seasons, infrastructure capacity may be a constraint.

Tariffs based on seasonal differences may be more practical and achievable in the irrigation sector due to the small number of customers involved and the greater seasonal variation. Price differentials based on peak seasons or peak periods may generate

[33] In the Mareeba Dimbulah Irrigation Area, a three part tariff included an annual connection charge (per customer), a fixed charge per megalitre of allocation and a use charge per megalitre of allocation. In some parts of the scheme, the allocation and use charges were set in declining blocks, with lower charges for larger users. The inclusion of an annual connection charge per customer is effective where there is a large number of small customers.

cost savings by alleviating peak capacity constraints.

The determination of the appropriate levels of seasonal charges is a complex matter, particularly to ensure minimum revenues. Seasonal pricing should result in a shift (intended) to higher use off-season, and the effects on revenues are difficult to predict, particularly in a volatile water supply market such as irrigation.

Peak period pricing may be a practical option for the irrigation sector.

Peak period pricing (with time of day tariffs) may also be practical in the irrigation sector to maximise utilisation of distribution and pumping infrastructure. A limitation on adoption of peak period pricing is the current deficiency in automated metering technology to enable tariffs to be disaggregated.

In summary, the Authority considers that seasonal pricing may have practical application in the irrigation sector, subject to cost effectiveness. Different seasonal charges would be effected through the usage charge in a two-part tariff.

Postage Stamp Tariffs and Nodal Pricing

In an urban context, the Authority is predisposed to tariff structures that reflect identifiable cost differences between geographic areas and customer groups.

Nodal pricing has potential in the irrigation sector where cost differentials can be identified.

Rural water service provision can involve geographically dispersed storage and distribution infrastructure incurring substantial variations in costs. There is scope for different charges to apply in channel segments to reflect pumping and infrastructure costs. Indeed, SunWater has already applied nodal pricing in some schemes to reflect the relative costs of gravity and relift areas, or where pumping is required to supplement flows.

Compared to the urban sector, there is greater scope for nodal pricing to apply to irrigation services as cost differentials may be more readily identified.

9.7 Summary of Issues

A key difference in the Authority's role in relation to the rural water sector is that irrigation customers of existing services are subject to price paths determined by the Government.

Although the Authority does not have a defined role in monopoly prices oversight in the existing irrigation sector, it may be required to consider monopoly prices oversight issues in new irrigation schemes and pricing or third party access matters in joint irrigation/urban/industrial supply schemes. Issues relevant to the application of the general pricing principles are as follows:

Maximum Revenue Requirement

- The maximum revenue requirement concept applies to the urban and industrial customer base of rural water schemes but is essentially not relevant for the existing irrigation customer base where price paths are in place.

- In considering the appropriate asset base for pricing purposes, the Authority will need to give consideration to the differences between the urban/industrial and irrigation sectors resulting from the impact of government pricing policies, capital contributions and subsidies, and the quality of the service.

Operating Costs

- For irrigation schemes, operating costs should be based on efficient costs where these can be practically determined, but may need to be 'averaged' to reflect 'normal' year costs.

- Cost allocations should reflect differences in the specification of products supplied to customer groups, for example, supply reliability.

Scarcity Values

- Scarcity values in irrigation water may be revealed through traded water entitlements or the sale of new entitlements. In establishing the scarcity value, the reason for the supply constraint will need to be ascertained, that is, whether due to infrastructure or hydrological constraints.

Two-Part Tariffs

- In the irrigation sector, it is likely that two-part tariffs will need to be adjusted to reflect water supply risk and environmental variables.

Seasonal Pricing

- Seasonal pricing options and nodal pricing can lead to efficient outcomes. These pricing options may be more readily applied to the irrigation sector because of the relatively small number of customers.

APPENDICES

A. ESTIMATING THE COST OF EQUITY

The cost of equity is not generally observable for government-owned businesses which are not listed on a stock exchange. In these circumstances, a number of alternative models have been developed to estimate the cost of equity funds, including the Capital Asset Pricing Model (CAPM), Dividend Growth Model, Price/Earnings ratio and Arbitrage Pricing model

A.1 Capital Asset Pricing Model (CAPM)

CAPM determines the return on equity using a single risk factor related to market return and may be represented as follows:

$$r_e = r_f + \beta_e(r_m - r_f)$$

Where:

r_e = expected after tax return on equity
r_f = risk free rate of return
r_m = return on the market as a whole
r_m-r_f = market risk premium
β_e = equity beta

The central concept of CAPM is that of undiversifiable risk (known as beta (β)). Basically, the total risk of a business activity can be separated into two distinct classes of risk, being undiversifiable and diversifiable risk. Undiversifiable risk relates to the correlation between the riskiness of an entity compared to the market as a whole. It can be calculated by a linear regression based on historic data.

The remaining risk is known as diversifiable risk. This risk can be removed by holding the security as part of a well diversified portfolio of investments. CAPM assumes that investors will not be compensated for the risk they can cost effectively avoid. This avoidable risk arises because the fluctuations in an investor's return from holding a security can be ameliorated by holding that security as part of a portfolio of diversified investments. In other words, CAPM assumes that investors will only be compensated through the rate of return for the risk that cannot be avoided through diversification. However, this is not to say that diversifiable risk is irrelevant for valuation purposes. This is because the rate of return (based on undiversifiable risk) is then applied to the organisation's cash flows. These expected cash flows should reflect the diversifiable risks.

A recent report from the Office of the Regulator-General (1998) referred to the 'established practice' of including an allowance in the cost of capital for non-systematic or diversifiable risks, including regulatory risks and the risks of major infrastructure dislocation, deliberately over-compensating investors for systematic risks. The Office addressed this, in the context of gas distribution access pricing, by erring towards the higher end of the estimated 'plausible range' for the cost of capital. Similarly, in the UK, some regulated water and water and sewerage companies have argued for an additional risk premium to be added to cost of capital estimates (reflecting asymmetric risks not captured in beta estimates), or for a 'headroom' factor to be added to aid the 'bankability' of the businesses. Ofwat has supported neither of these approaches (Ofwat 1999b). The Authority, however, proposes to address diversifiable risk in its assessment in the expected cashflows of the business.

Since the beta of the market portfolio is 1, then all assets can be identified as being more or less risky than the market as a whole. For example, an enterprise with a beta of 1 has undiversifiable risk that is identical to the market as a whole. A higher beta is generally associated with a more risky investment relative to a lower one.

CAPM asserts that the market risk premium required per unit of undiversifiable risk is the same across all assets. Therefore, given the risk free rate, the beta of an asset and the overall market return, the CAPM estimates the expected cost of equity funds for those assets.

CAPM remains subject to theoretical controversy. Ergas (1998), for example, suggests that it is the variance of earnings, rather than the covariance with market returns, that determines the required rates of return on investment. Ergas suggests that, for capital intensive industries (particularly telecommunications), CAPM-based estimates will be unreliable, and likely will underestimate the cost of capital.

There are also practical difficulties in implementing CAPM, especially in respect of water businesses which are undertaken by State and local governments and for which there are no directly comparable companies listed on a stock exchange. In these cases, the estimation of the equity beta (β_e) is not entirely objective and judgement is required in practice.

A.2 Dividend Growth Model

Dividend Growth Model (DGM) is a variation of the discounted cash flow (DCF) model. DCF models are based on the valuation in current terms of projected future cash that would be generated by a company's assets. Under DGM, projections of future dividends and expected growth in dividends are discounted back to today's dollars, and compared against current share values as a measure of shareholders' expectations of the future return on their investment.

DGM is conceptually sound where key assumptions may be predicted with a reasonable degree of accuracy, although it assumes that dividend growth is to continue in perpetuity at a constant rate. The DGM approach also is non-linear, in that the rate of return estimate is very sensitive to changes in the underlying assumptions

In practice, DGM may only be applied to companies with a reasonable history of dividend payments and for which estimates of future dividend growth can be forecast accurately. Consequently, this approach is unlikely to be suitable for determining a rate of return for any State or local government owned water supply businesses, although it could be applied to some listed private sector companies which are subject to prices oversight or third party access provisions.

Where it is applied, DGM often is used as a check for CAPM-based cost of equity estimates, rather than as a stand-alone alternative estimation method (Armstrong, Cowers and Vickers 1994).

A.3 Price Earnings Ratio

The price earnings (PE) ratio method involves capitalising the estimated future maintainable earnings of the business at a price/earning multiple appropriate to the risks and prospects of the business.

PE ratios are easily calculated and are commonly used in practice for established businesses with a financial track record and smooth earnings flows. The main criticism of PE ratios is that they rely heavily on book earnings, which are poor measures of expected earnings especially in periods of high inflation.

A.4 Arbitrage Pricing Theory (APT)

APT is a multi-factor equivalent of CAPM and requires:

- identification of risk factors (typically macro economic factors) affecting the stock;

- measurement of the risk premium for each of these factors; and
- measurement of the sensitivity of the company's shares to each of these factors.

APT is rarely used in practice because despite its complexity the method generally does not significantly improve the results compared with CAPM. In addition, there is no consensus about the identity of risk factors. Also, where there are more risk factors involved, there are more risk factor sensitivities to be estimated with greater potential for error.

A.5 Fama-French Model

The Fama-French model is a three factor security model where the cost of equity capital is related to the market risk of the company (as for CAPM), as well as to company size (measured by the market value of the company's equity) and to the ratio of its book value of equity to its market value of equity (Davis and Handley 1998). Under this model, the cost of equity is presumed to be higher for smaller entities, and for those with a higher book-to-market equity ratio.

As for other approaches, the Fama-French model is particularly difficult to apply where the subject entity is not listed on a stock exchange. Other limitations include that the model is still in its infancy, having been developed only in 1993, and is not widely accepted as it was derived empirically rather than from a theoretical foundation. This may mean that the factors identified in the model may simply be uncertain proxies for the actual underlying risk factors that have not yet been identified.

B. ISSUES IN THE QUANTIFICATION OF THE RATE OF RETURN

B.1 The Risk Free Rate

Estimating a return on equity under CAPM requires the estimation of the risk free rate (r_f), or the return to a risk free security of the same duration as the term of the investment.

There is some debate about the appropriate approach to estimating the risk free rate. In general, theoretical and regulatory literature supports the use of the Commonwealth Government bond or note of the same duration as the term of the investment as a proxy for the risk free rate.

The Authority has assessed the choice of an appropriate maturity recently, and proposes to adopt the ten year Commonwealth Bond rate for this purpose as the available market risk premium is only expressed relative to the 10 year bond rate.

With respect to the measurement of the 10 year bond rate, two alternatives are available:

- the use of "on the day" current market yield of the spot 10 year Commonwealth Government bond rate; and
- the use of an average historical spot 10 year Commonwealth Government bond rate.

The current yield should reflect all available information including any historical information about previous prices. While it is possible that on any particular day an extraordinary event may occur, as the regulatory decisions will generally not coincide with the release of new economic information it is unlikely that any adjustment will be necessary. However, should there be a movement on the day, followed by a movement of similar magnitude on the following day in the opposite direction, that together sum to in excess of 30 basis points, an average over the preceding 5 trading days will be adopted.

B.2 The Market Risk Premium

The market risk premium ($r_m - r_f$) is based on the difference between the return on the market as a whole (r_m) and the risk free rate (r_f), both of which vary considerably over time. This may be attributed mainly to short term business cycles and the fact that measures of risk premia are influenced by the measurement period. However, over longer periods, the market risk premium appears fairly stable.

Some studies have suggested that the equity risk premium has reduced significantly in recent years due to the effect of dividend imputation (see below). Research by the Authority indicates that there has been a decline in the market risk premium since 1987, but that this is not likely to be solely attributable to dividend imputation. Other relevant factors could include changes to workforce demography, changes in the pattern of share ownership, a sustained decline in the level of inflation and increased influence of institutional investors, and more effective market communications.

In the United Kingdom, Ofwat has used an equity risk premium of between 3 and 4% (Ofwat 1998), with regulators in Australia applying a higher range of between 6 and 8 per cent (see Officer 1989). More recent studies, however, indicate that the market risk premium in Australia may have declined, perhaps even below this range. In practice, however, the Authority would propose to adopt a market risk premium of 6 per cent which is at the low end of the traditional 6 to 8 per cent range and at the mid-point of the 5 to 7 range now considered by many market participants to be most appropriate.

In theory the CAPM requires that a forward-looking r_m be based on a time frame corresponding to the period of the analysis. However, in practice this data does not exist, and it generally is necessary to extrapolate from historical data.

B.3 Equity Betas

Equity betas incorporate the financial risk associated with an entity's capital structure as well as the risk associated with holding the assets used in the business (which is reflected in the asset beta).

For entities with no traded equity, like most government business activities, it is necessary to use judgement in determining the appropriate equity betas to be used in the estimation of the required return on equity funds. As is the case for companies with traded equity, equity betas used in calculating WACCs for government businesses and other unlisted entities should reflect the perceived undiversifiable risk involved in that business.

In addition to the underlying market risks, three factors have been identified as key determinants of an entity's equity beta:

- *financial leverage* – the ratio of debt to total capital, where a higher level of debt implies a higher beta;
- *operating leverage* – the proportion of the cost structure that is fixed, where a higher level of fixed costs implies a higher beta; and
- *sensitivity of cashflows* – relative to overall economic activity, where more cyclical cashflows are associated with higher betas (Davis and Handley 1998).

It is generally accepted that the water industry has many characteristics that make it materially lower risk than other equity investments – including a non-cyclical business, little risk of insolvency and very limited competition (Ofwat 1998) – which should contribute to a lower beta estimate than the market as a whole.

Estimates of equity betas for listed water companies range between 0.12 for some US water services business, to 1.2 for some South American water services businesses, although most range between 0.3 and 0.5 (Bloomberg 1998)[34]. In Australia where CAPM has been applied, estimates of equity betas for water utilities are marginally higher, at between 0.6 to 0.8.

To be meaningful, any comparisons with these estimates should also recognise differences in the relevant economic environment, regulatory framework, and financial and operating structures of the subject entities. Equity betas are a measure of relative risk, and as such measure the risk relative to that particular market and may not translate directly to another market (in another country).

One approach is to estimate a plausible range for equity betas (usually in the order of 0.6-0.8 for Australian water utilities) and then undertake subjective analysis of factors such as company size, growth prospects and the like to determine the likely position within that range. This is the approach the Authority would propose to adopt for its regulatory responsibilities for the urban water sector.

[34] A recent study by ABN AMRO of 14 French, US and UK water utilities for the Independent Pricing and Regulatory Commission (IPARC) of the Australian Capital Territory found an average asset beta of 0.48 (IPARC 1999). In the context of ACTEW, IPARC reported that this corresponded to an equity beta within the range of 0.74 to 0.79 used in its regulatory pricing determination.

B.4 Return on Debt and Debt Guarantee Adjustments

Quantification of the required return on debt (r_d) often is based on actual rates of interest charged on specific debt instruments used by the company.[35] For most government business activities, the perception of some implicit guarantee provided by the Crown may result in lower borrowing rates for those businesses than if they were privately owned. For local government water businesses, debt finance generally is sourced from the Queensland Treasury Corporation, and borrowed by the local government parent rather than the business entity itself.

Where problems exist in observing the actual (stand-alone) cost of part or all of an entity's debt, an alternative approach is to assess the entity's credit rating based on its interest cover, debt payback period and internal financing ratio. This credit rating can be used to estimate a premium over the risk free rate that, when added to the risk free rate, is a measure of the cost of debt for the entity. In this instance, lower credit ratings are associated with higher premia (see Table B1 below). At the State Government level, reviews are made every three years for Government Owned Corporations (GOCs).

Table B1: Indicative Credit Ratings and Interest Differentials

Credit Rating	**Interest Differential (%)**	
	Short-term debt (< 1 year)	*Long-term debt (>1 year)*
AAA	-	-
AA	0.04	0.14
A	0.13	0.26
BBB	0.34	0.47
BB	0.98	1.42
B	2.05	3.22

Source: *Government Guarantee Fee Policy for NSW Government Businesses*, NSW Treasury, September 1997

Larger local government businesses could engage an external ratings agency to produce a 'desktop' credit rating for the business, with 'notional' credit ratings or indicator lending rates to be considered as options for smaller businesses. The relationship between credit rating and risk premium, however, is not straightforward and care must be exercised in applying this method to estimate the cost of debt for an entity.

An alternative approach would be to estimate an industry average cost of debt, represented as a margin above the risk free rate, and use this rate for regulatory purposes. This approach has the advantage of removing ownership considerations from regulatory decisions (although issues of debt guarantee adjustments may still need to be considered where government-owned businesses dominate, as is the case in the urban water sector). It also creates incentives for businesses to manage debt portfolios to reduce interest charges to at or below the industry average.

[35] An alternative is to use a variant of CAPM as a means of modeling debt, based on the risk free rate, the market rate and the debt beta. This can be expressed as follows:

$r_d = r_f + \beta_d \bullet (r_m - r_f)$

Where:

r_d = expected return on debt
r_f = risk free rate of return
β_d = debt beta
r_m = market rate of return

As with equity betas, determination of debt betas is a matter of judgement. Debt betas tend to be very small, as debt holders generally face much less risk than do equity holders. In fact, for many large 'blue chip' entities β_{debt} is assumed to be zero, and is removed from the analysis. Arguably, given that the cost of debt is more readily observable than the cost of equity, a more appropriate approach is to use an alternative such as the margin above the risk free rate or the actual cost of debt.

In general, the Authority would be predisposed towards using an industry average cost of debt for regulatory purposes, adjusted to account for any differences in gearing and for any implicit Government guarantee effects.

B.5 Capital Structure

The mix of debt and equity held by an entity is referred to as its capital structure. The capital structure determines the allocation of cash flows between servicing debt and providing a return on equity, and needs to provide an entity with sufficient flexibility to finance capital expenditure, which is particularly important if the entity has irregular, large capital expenditure, and to respond to changing market conditions.

It is essential to consider the capital structure of a business in assessing its cost of capital.

Ofwat in the United Kingdom has proposed a benchmark gearing (debt to debt plus equity) ratio of between 45 and 55% for both regulated water and water and sewerage companies. This represents its view of a prudent and desirable capital structure for such companies. Where companies are outside this range, Ofwat imputes a shadow capital structure for the purposes of determining a regulated price. Similar approaches have been applied domestically for regulation of electricity transmission and distribution businesses.

Australian urban water utilities demonstrate generally low levels of gearing, ranging from 5 per cent for Hunter Water Corporation, 10 per cent for Brisbane Water, and 17 per cent for Gold Coast Water (WSAA 1998). In contrast, the South East Queensland Water Corporation (formerly South East Queensland Water Board) has been established with a gearing of approximately 50 per cent as part of the corporatisation process, up from a gearing of around 13 per cent previously.

For businesses where a substantial proportion of relevant assets are leased through a holding company or similar facility, similar principles need to be applied to any assessment of the appropriateness or otherwise of the lease charge (which nominally would be expected to include an allowance for a return on capital and other capital-based charges).

B.6 Dividend Imputation

Dividend imputation refers to the pass through of company tax payments as credits against the personal tax liability of shareholders. Dividend imputation was introduced in Australia in July 1987.

To accommodate dividend imputation, the definition of risk premium in the CAPM requires an adjustment for the capitalised value of personal tax credits to maintain consistency between the cost of capital and cash flows which are defined on an after-company-tax-but-before-personal-tax basis.

The value of imputation credits to a particular shareholder depends on whether a shareholder is able to both access and utilise those credits. This is represented by the gamma (γ) variable in the CAPM equation – ie, for an investor who is unable to utilise the franking credits gamma equals zero. Lower levels of imputation effectiveness ($\gamma \rightarrow 0$) imply a higher cost of capital.

Australian regulatory experience with dividend imputation is still at an early stage, and particularly so for the urban water sector. Of the various regulatory cost of capital determinations made for urban water businesses in Australia, only one (ACT) has specifically addressed the issue of dividend imputation. In this case, an imputation effectiveness of 25 per cent was applied.

Compounding this is the dominance in the urban water sector of publicly-owned utilities which are generally exempted from Commonwealth income tax, and for which the parent local or State Government retains any tax equivalent payments. The central question for these entities is whether, and to what extent, owners can access and benefit from the "tax-paid" dividends they receive from subsidiary water businesses.

One option is to estimate the equity market average imputation effectiveness rate, and to use this for regulatory cost of capital determinations. This alleviates any potential competitive neutrality concerns in respect of advantages that publicly-owned businesses may enjoy over private sector rivals, and also recognises capital employed in the urban water sector necessarily is diverted from other potential applications in the equity market. To date, this approach has been used by the Authority in various pricing applications.

B.7 Pre- or Post-Tax Cost of Capital

The cost of capital can be expressed in before- or after-tax terms, depending on the status of cash flows used in the relevant calculations. The cost of equity funds (from CAPM) generally is expressed on an after-company-tax-but-before-personal-tax basis, while the cost of debt finance is usually expressed on a pre-tax basis. In both cases these reflect the market rate.

There are broadly two approaches that may be used to convert a post-tax WACC to a pre-tax measure:

- dividing the post-tax WACC by (1 – tax rate); or
- calculating directly, for each year, the cost of tax and incorporating these costs in the cash flows, or via a "tax wedge"[36] adjustment directly to the WACC.

Under each approach, there are broadly two options for calculating the tax rate – the statutory rate (36 per cent currently, though transitioning to 34 per cent in 2000-01 and 30 per cent thereafter) or an estimated 'effective rate', which adjusts the statutory rate for both timing and permanent differences.[37] Hathaway and Officer (1995), for instance, found that the effective company tax rate in Australia was closer to 19 per cent than the statutory rate of 36 per cent.[38]

Estimating the effective tax rate for a long-life infrastructure asset is dependent on assumptions regarding future tax rates, inflation and the depreciable value of the asset for tax purposes, all of which are uncertain. Consequently, a number of regulatory jurisdictions, including IPART in New South Wales and the ACCC, advocate the use of the statutory tax rate. In practice, however, where a high level of dividend imputation effectiveness is assumed, the issue of the tax rate becomes less significant.

For businesses dominated by a single asset, accelerated depreciation allowances may result in low effective tax rates in early years, potentially leading to higher prices in later years as effective taxes rise. The relevance of this so-called 'S-bend phenomenon' will depend on future tax laws, asset ownership and investment, inflation and the basis used for pass-through of depreciation in pricing. Because of these variables, and recent changes to company tax rules which reduce the impact of the S-bend, the Authority will need to consider these effects as they arise.

[36] The cost of tax or "tax wedge" is the premium added to the post-tax WACC to compensate for tax liabilities and to estimate the pre-tax cost of capital.

[37] For long life infrastructure assets, owners may be able to claim higher tax deductions in the early years of the asset's life, bringing forward tax deductions and increasing the value of these benefits in net present value terms.

[38] Hathaway and Officer emphasised, however, that this rate was the average across Australia, and that individual market sectors or companies may experience substantial variations from the average.

There is considerable (academic and regulatory) support for the use of a post tax cost of capital, which removes the need to estimate effective tax rates and associated difficulties. Post tax cost of capital measures also are more relevant for investors. Accordingly, the Authority would propose to adopt a (nominal)[39] post-tax cost of capital measure for prices oversight and third party access purposes.

Table B2: Summary of cost of capital determinations for the urban water sector in other regulatory jurisdictions

	New South Wales	**Australian Capital Territory**	**Victoria**	**Tasmania**	**United Kingdom**
Regulator	IPART[a]	IPARC[b]	Government[c]	GPOC[d]	Ofwat[e]
Rate of return	7% real, pre-tax	7.49% real, pre-tax	n/a	4.5%/7.0% real, pre-tax	4.75% real, post-tax
Market premium ($r_m - r_f$)	n/a	5.5%	n/a	3.5%	3%-4%
Risk free rate (r_f)	n/a	5.53%c	n/a	Cth 10yr bond rate	Index-linked gilts, 2.5%-3.0%
Debt rate (r_d)	Cth 10yr bond and 180 bank bill rate	6.63% (incl. debt premium)	n/a	-	2.8%-3.5% real
Debt guarantee premium	Included but not specified	110 basis pts on risk free rate	n/a	-	Not applicable
Equity beta (β_e)	n/a	0.77	n/a	-	avg 0.7-0.8
Imputation (γ)	n/a	40%	n/a	-	Not applicable
Capital structure (debt/debt+equity)	n/a	50%	n/a	-	45%-50% target

[a] IPART has recently completed a review of the price paths for the four metropolitan water utilities under its jurisdiction. Comment has been sought on each of the components of the WACC/CAPM calculations (IPART 1999b). NSW Treasury, in a submission to IPART, has indicated its continued support for a WACC of 7 per-cent (real, pre-tax), although noted this may need to be revisited in light of any future monetary policy tightening.

[b] Calculated for ACTEW's combined water and sewerage and electricity functions. References are to "medium" scenarios from the final price direction (IPARC 1999).

[c] Prices were frozen in 1995 by the previous Victorian Government and have not been revised subsequently. Prices are understood to have been developed using the building block approach, including a return on assets, though details are not publicly available.

[d] The Government Prices Oversight Commission of Tasmania has used the average return actually realised by large metropolitan water authorities as the basis for its target rate of return on 4.5%. A commercial rate of return (7.0% real, pre-tax) is to apply to all new capital expenditure, and has been calculated using a fixed margin of 3.5% above the Commonwealth 10-year bond rate (GPOC 1998).

[e] A premium of 0.75% has been added for water only companies, with the exception that the three largest water only companies for which a premium of 0.4% was used. The estimate of the cost of capital was taken as the midpoint of the range 4.25%-5.25% provided by the Office's financial advisers. Equity betas have been geared. The risk free rate has been derived from index-linked gilts, a form of Government bond (Ofwat 1999b).

n/a not available or specified

[39] Where the regulatory asset base is valued in current dollar terms, some regulators maintain that the cost of capital must be determined using a *real* measure (ie, net of inflationary effects). The ACCC, however, maintains that nominal and real measures are essentially equivalent and favoured the use of a nominal WACC for regulation of electricity transmission businesses, even though a current asset valuation was adopted. The Authority would suggest that the use of a nominal measure is preferred in that:

- tax and balance sheet items such as debt and equity all are expressed in nominal terms and must be deflated if modelling is to be done on a real basis; and
- a nominal WACC is directly comparable to other financial benchmarks.

C. ISSUES IN APPLYING THIRD PARTY ACCESS TO THE WATER SECTOR

C.1 Third Party Access and Water Services

In regulating access to monopoly infrastructure services, a key consideration is that access frequently is sought only for a defined service and utilises only a part of the overall network. In these circumstances, a range of complex issues arises, including the cost of accessing these segments of the network separately. Arguments range from prices reflecting only the variable/marginal costs of access, through the stand-alone cost of access. These concepts and issues are discussed further in Chapter 7.

Access disputes, at least initially, are more likely to arise for larger 'bottleneck'-type facilities (such as bulk transmission pipelines) which may be amenable to a greater degree of accounting separation from the remainder of the network for pricing purposes. In contrast, prices oversight disputes may involve determining a price for an integrated network service such as local reticulation of water, where cost-allocation between consumers/services becomes more prominent.

Third party access (and particularly consideration of access undertakings) also requires that attention be given to a range of issues not directly relevant to monopoly prices oversight. These include:

- services to be included for access, including how access is defined;
- monitoring and control of water quality;
- capacity management and security of supply;
- trading and queuing; and,
- extensions and facility expansions.

Third party access prices are for infrastructure services only, and would not include any element for the scarcity value of water that may form part of the 'delivered' price under monopoly prices oversight. This necessarily requires that prices be 'unbundled' to identify the respective components for the relevant services versus the 'commodity'.

Regulatory access price setting needs to balance the interests of facility owners, who seek to maximise revenue from access charges (or to preserve market power in related markets), against gains from promoting efficiency in the use of the facility. To achieve such gains generally requires that prices be based on the marginal cost of providing access.

Regulatory intervention through third party access also must consider the incentives created under the regulatory regime for investment in regulated facilities. In other words, consideration must be given not only to efficiency considerations in terms of how an *existing* facility is utilised (static efficiency), but to the incentives implied from the terms and conditions under which access is granted (dynamic efficiency).

Inappropriately applied third party access could, by providing overly favourable terms to the access seeker relative to the access provider, delay socially desirable infrastructure investments, or alternatively encourage investors to inefficiently 'race' to develop facilities.

Access terms should be non-discriminatory. An access seeker should be charged no more than another user facing similar circumstances, and the terms of access should not include any non-tariff provisions that advantage one user over another. This principle is particularly important

where the access seeker is competing with a (vertically integrated) access provider in a downstream market.

C.2 Access in the UK Water Sector

In the United Kingdom, third party access to water services is covered by the introduction of what Ofwat terms "common carriage". Common carriage requires all water companies to develop arrangements to respond to future requests for access, with Ofwat encouraging commercial negotiation of access terms and conditions. Ofwat expects companies to develop and publish disaggregated costings for different network services (in effect requiring full accounting separation for the retail and network businesses) with access charges to be cost-reflective and non-discriminatory.

Ofwat also provides for "inset appointments", where new entrants are able to compete to provide services to large (existing or new) customers within the licence area of an existing supplier. This approach effectively is a simple form of access, as the incumbent is required to provide for the use of its network to competing suppliers.

C.3 Access in other Utility Sectors

Electricity and Gas

For electricity transmission and distribution in Australia, 'open access' is an integral requirement for participants in the developing National Electricity Market (NEM). Distribution and transmission prices, effectively a form of third party access charge, almost universally have been set using the building block approach, coupled to some form of price or hybrid-revenue/price cap. These arrangements, however, are still evolving as various jurisdictional issues remain in transition.

Gas transmission charges are regulated in accordance with the National Third Party Access Code for Natural Gas Pipeline Systems. Central to access arrangements under the Code are 'reference tariffs', which act as a benchmark tariff for a specific (reference) service, in effect giving users as-of-right access to the reference service at the reference tariff. Reference tariffs essentially are set to reflect the revenue requirements of the facility.

Telecommunications

In Australia, telecommunications access prices are based on the total service long run incremental cost (TSLRIC) of providing third party access. TSLRIC is defined by the ACCC as the incremental costs the access provider incurs in the long term in providing the service, assuming all of its other production activities remain unchanged. Alternatively, TSLRIC is the cost the business would avoid if it stopped providing a particular service altogether.

TSLRIC includes operating and maintenance costs, as well as a normal commercial return on capital, and allows the service provider to fully recover its costs of providing access. Full cost recovery clearly is consistent with the interests of the facility owner, but pricing at TSLRIC means that prices may depart from the more efficient marginal cost base.

Access charges in Australia set based on TSLRIC would not compensate the incumbent (access provider) for any lost profits that may result from increased competition in downstream markets. Access pricing for the New Zealand telecommunications sector is based on the efficient component pricing rule (ECPR) or optimal input pricing rule.[40] Under ECPR the price

[40] New Zealand does not have a specific utility regulator, and instead relies on general competition law for regulation of monopoly businesses. A new entrant to the telecommunications market, Clear Communications, sought access to the incumbent's (Telecom NZ) network and ultimately resorted to court action when negotiations to gain what it considered a 'reasonable' interconnection charge failed. On appeal, the courts

includes the opportunity cost to the access provider of allowing access, including foregone profits in related markets. This rule will tend to preserve monopoly profits, to the extent they already exist, but is designed to ensure that the access seeker is at least as efficient as the provider.

ECPR effectively leaves the access provider in a revenue neutral position, and therefore is more aligned with the interests of the facility owner. However, it provides a high hurdle for any new entrant to clear, and limits incentives for innovation by the access provider. Also, and to the extent that it compensates access providers for losses resulting from increased competition, ECPR may be inconsistent with the *QCA Act* (specifically the s120 requirement that access providers be compensated for the direct costs of providing access, but not costs associated with losses arising from increased competition).

determined that ECPR was an appropriate basis for access pricing. Following two years of further negotiations, an interconnection agreement ultimately was made, although is understood to be back before the courts following an alleged breach by one of the parties.

REFERENCES

Armstrong, M., Cowan, S. and Vickers, J. (1994), *Regulatory reform: Economic Analysis and British Experience*, The MIT Press, London.

Australian Competition and Consumer Commission (1998a), *Network industry regulation and convergence in service delivery: challenges for suppliers, users and regulators*, APPEA Journal 1998.

____ (1998b), *Economic regulation of airports – an overview*, July.

Averch, H. and Johnson, L. (1962), *Behaviour of the firm under regulatory constraint*, American Economic Review, 52, pp.1052-69.

Baxter, P. (1999), *Water pricing policy and practice*, Presentation to PricewaterhouseCoopers water industry reform seminar, August.

Bureau of Industry Economics (1995), *Issues in infrastructure pricing*, Research Report No. 69, August, AGPS, Canberra.

Campbell, H. (1999), *Principles for pricing urban water*, Research report commissioned by the Queensland Competition Authority, September.

Coase, R. (1946), *The marginal cost controversy*, Economica, Vol. XIII, August, pp. 169-182.

Davis, K. and Handley, J.C. (1998), *The cost of capital and access arrangements*, Infrastructure regulation and market performance: principles and practice, Australian Competition and Consumer Commission and Public Utility Research Centre, University of Florida, May.

Dayananda, D. and Smith, L. (1997), *Queensland water pricing policies and their financial and economic implications*, Central Queensland Journal of Regional Development, vol. 5, no. 2, pp.36-46.

Department of Natural Resources, (1999), *Water industry reform in Queensland*, Presentation to PricewaterhouseCoopers water industry reform seminar, August.

Ergas, H. (1998), *Valuation and costing issues in access pricing with specific application to telecommunications*, Infrastructure regulation and market performance: principles and practice, Australian Competition and Consumer Commission and Public Utility Research Centre, University of Florida, May.

Fitzgerald, V., Carmichael, J., McDonough, D., and Thornton, B. (1996), *Report of the Queensland Commission of Audit*, Government Printer, Brisbane.

Government Prices Oversight Commission (1998), *Investigation into the pricing policies of Hobart Water, North West Regional Water Authority and Esk Water*, Final Report, December.

Gold Coast City Council (1997), *A water pricing strategy for the City of Gold Coast*, Water Pricing Advisory Committee, Volume I, January.

Hathaway, N. and Officer, R. (1995), *The value of imputation tax credits, Finance and Research Group, Graduate School of Management*, unpublished manuscript fist presented at a Pacific Basin Finance Conference in New York, December 1991.

Hunter Water Corporation (1999), *Price reform beyond 2000: Hunter Water Corporation's submission to IPART for the medium term price path 2000-2004*, December.

Independent Pricing and Regulatory Commission (1999), *ACTEW's Electricity, water and sewerage charges for 1999/2000 to 2003/2004: Price Direction*, May.

Independent Pricing and Regulatory Tribunal (1999a), *Regulation of network service providers – price control issues and options*, Discussion Paper DP-34, March.

_____ (1999b), *Pricing of water, sewerage and stormwater services: Sydney Water Corporation, Hunter Water Corporation, Gosford City Council, Wyong City Council, Sydney Catchment Authority – Issues paper*, Discussion Paper DP-37, October.

_____ (1999c), *Review of developer charges*, Report prepared by PricewaterhouseCoopers and the Centre for International Economics, Research Paper No. 16, October.

Khan, A. E. (1995), *The economics of regulation: principles and institutions*, The MIT Press, England.

King, S. and Maddock, R. (1996), *Unlocking the infrastructure*, Allen and Unwin, Sydney.

Laffont, J. and Tirole, J. (1993), *A theory of incentive in regulation and procurement*, Cambridge MIT Press.

Lewis, T. and Garmon, C. (1997), *Fundamentals of incentive regulation*, Public Utilities Research Centre/World Bank International training program on utility regulation and strategy, June.

Littlechild, S. (1983), *Regulation of British Telecommunications' Profitability*, London, Department of Industry.

London Economics (1995), *Pricing principles for water, sewerage and drainage services*, April.

_____ (1997), *Water pricing: the importance of long run marginal costs*, Report prepared for the Office of Water Services, February.

_____ (1999), *Review of Australian transmission pricing*, Report prepared for the Australian Competition and Consumer Commission, April.

Marsden Jacob Associates (1997), *Guidelines for evaluation of introducing and improving two part tariffs*, October.

_____ (1999a), *Urban water pricing principles*, Research report commissioned by the Queensland Competition Authority, September.

_____ (1999b), *Third party access: Issues for price setting for urban water businesses*, Research report commissioned by the Queensland Competition Authority, November.

_____ (1999c), *Gifted assets: consideration in price setting for urban water businesses*, Research report commissioned by the Queensland Competition Authority, November.

Mayer, Prof. C. and Jenkinson, Dr. T, (1999), *What's the real rate?*, The Utilities Journal, July.National Competition Council (1998), *Compendium of National Competition Policy Agreements*, Second Edition, June 1998.

Ng, Y. (1987), *Equity, efficiency and financial viability: public-utility pricing with special reference to water supply*, The Australian Economic Review, 3rd Quarter.

Office of the Regulator General (1998), *Access arrangements Multinet Energy Pty Ltd and Multinet (Assets) Pty Ltd, Westar (Gas) Pty Ltd and Westar (Assets) Pty Ltd, Stratus (Gas) Pty Ltd and Stratus Networks (Assets) Pty Ltd –Final Decision*, October.

Office of Water Services (1998), *Setting price limits for water and sewerage services: the framework and business planning process for the 1999 Periodic Review*, February.

_____ (1999), *The future of competition*, Speech by Director-General of Water Services to the Economist Conference, London, October.

_____ (1999b), *Final determinations: future water and sewerage charges 2000-05*, November.

Officer, R. (1989), *Share markets and portfolio theory*, in Ball, Brown, Finn and Officer.

_____ (1994), *The cost of capital of a company under a dividend imputation tax system*, Accounting and Finance, 34/1, May.

Organisation for Economic Co-operation and Development (1999a), *Household water pricing in OECD countries*, Working Party on Economic and Environmental Policy Integration, ENV/EPOC/GEEI(98)12/FINAL

_____ (1999b), *Industrial water pricing in OECD countries*, Working Party on Economic and Environmental Policy Integration, ENV/EPOC/GEEI(98)10/FINAL

PricewaterhouseCoopers, (1999), *Urban water pricing – Asset optimisation*, Research report commissioned by the Queensland Competition Authority, November.

Queensland Competition Authority (1997), *Criteria for the identification of government monopoly business activities*, December.

Queensland Treasury (1996), *Community service obligations: An issues paper*, Report prepared for the Queensland Commission of Audit.

_____ (1999), *Community service obligations: A policy framework.*

Queensland Water Reform Unit (1999*), A regulatory framework for the provision of water services in Queensland,* April.

_____ (1999), *Water reform implications for local government in Queensland,* December.

Raftelis, G. (1993), *Comprehensive guide to water and wastewater finance and pricing*, 2nd Edition, Lewis Publishers, Michigan.

South East Queensland Water Board (1998), *Annual Report 1997-98*, Brisbane.

Tasman Asia Pacific (1997), *Third party access in the water industry: an assessment of the extent to which services provided by water facilities meet the criteria for declaration of access*, Final report the National Competition Council, September.

Theaker, P. (2000), *Key issues in incentive-based regulation of electricity networks*, Paper presented to the ESAA conference on economic regulation, University of Technology Sydney, February.

van den Berg, C. (1997), *Water privatization and regulation in England and Wales*, Public Policy for the Private Sector, The World Bank Group, no.115, May.

Warner, R. (1996), *Water pricing and marginal cost of water*, Urban Water Research Association of Australia, Occasional Paper No 1, December.

Water Services Association of Australia (1998), *WSSA facts '98*, Melbourne.