Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin

Issues Paper

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

Investigation into Price Structures to Reduce the Demand for Water in the Sydney Basin

Issues Paper

Discussion Paper DP72

December 2003

ISBN 1 877049 34 4

Request for Submissions

Submissions are invited from interested parties to all Tribunal investigations. Unless confidentiality is sought, the submissions are generally available for public inspection at the Tribunal's offices and will be available on-line in PDF format from the time of processing of the submission until 3-4 weeks after the release of the final report of an inquiry. The Tribunal exercises its discretion not to exhibit any submissions based on their length or content (containing material that is defamatory, offensive, or in breach of any law).

Submissions must be made in writing and should be sent to the postal address, fax number or email address below. Where possible submissions should be provided in a computer readable format (eg, word processor, PDF or spreadsheet) either on disk or by email.

Submissions must be received by 27 February 2004.

All submissions should be sent to: **Water Price Structures in the Sydney Basin**
Independent Pricing and Regulatory Tribunal
PO Box Q290
QVB Post Office NSW 1230

Email: ipart@ipart.nsw.gov.au

Submissions will be treated consistent with the *Privacy and Personal Information Act 1998*.

Confidentiality

If you want your submission, or any part of it, to be treated as confidential, please indicate this clearly. The Tribunal may include in its publications a list of submissions received during the course of a particular review or inquiry. It may also refer to submissions in the text of its publications. If you do not want your submission or any part of it to be used in any one of these ways, please indicate this clearly.

A request for access to a confidential submission will be determined in accordance with the *Freedom of Information Act* and *section 22A of the Independent Pricing and Regulatory Tribunal Act*.

Privacy

All submissions will be treated in accordance with the *Privacy and Personal Information Act 1998*. Any personal information you give us will not be reused for another purpose.

Public information about the Tribunal's activities

Information about the role and current activities of the Tribunal, including copies of latest reports and submissions can be found on the Tribunal's web site at www.ipart.nsw.gov.au.

Inquiries regarding this review should be directed to:

Christopher Spangaro ☎ 02 9290 8419
Greg Perrett ☎ 02 9290 8427

Independent Pricing and Regulatory Tribunal of New South Wales
Level 2, 44 Market Street, Sydney NSW 2000
☎ (02) 9290 8400 Fax (02) 9290 2061
www.ipart.nsw.gov.au
All correspondence to: PO Box Q290, QVB Post Office NSW 1230

TABLE OF CONTENTS

1 INTRODUCTION

Potable water is currently being consumed in the Sydney Basin at a level above the sustainable supply from existing infrastructure. The New South Wales Government is working to address this supply/demand imbalance through a range of responses, including demand management programs and securing additional supplies within urban areas.

The NSW Government has asked the Tribunal to investigate and report on the use of pricing structures to reduce demand for water in the Sydney Basin (the full Terms of Reference for the review are included in Appendix 1). This investigation is a prelude to the next pricing review for the metropolitan water agencies including Sydney Water Corporation (Sydney Water) and Sydney Catchment Authority (SCA) which will set prices to apply from July 2005.

The current investigation provides an opportunity for the Tribunal to explore and investigate alternative pricing structures prior to commencing the next price determination process in mid 2004. When the Tribunal sets actual prices it will do so also having regard to the efficient costs involved in running each of these businesses beyond 2005. These costs will only be known following independent scrutiny of each agency's cost base in late 2004.

Whilst an objective of this investigation is to assess the capacity for alternative price structures to reduce demand for water, the Tribunal will be considering this question within the framework of broader considerations it is required to take account of by its Act. These include consideration of social impacts. This is also reflected in the Terms of Reference for this investigation, which specifically require that regard be given to the affordability and equity impacts of alternative price structures.

The task for the Tribunal therefore, is not simply to consider which pricing structures would most reduce demand for water. It must consider the other impacts of alternative price structures including the potential impacts on lower income large households. However, the weighing and balancing of competing priorities and interests is common to much of the work of the Tribunal. It will be greatly assisted in this task by well argued submissions and feedback from a broad range of stakeholders.

1.1 Review process and timetable

As part of this review the Tribunal will consider:

- the use of a **wholesale** step price (paid by Sydney Water to the SCA) for extractions above the estimated sustainable yield of the catchment; and
- the establishment of pricing principles and a framework that may be adopted in moving to alternative **retail** price structures, including inclining block tariffs and reductions in fixed water charges.

As part of the investigation process, the Tribunal will consult with stakeholders and undertake its own research and analysis. It will request specific financial and operational information from Sydney Water and the SCA and invite these businesses and other stakeholders to make submissions to the review. It will also hold a public hearing to provide further opportunity for stakeholders to express their views. A final report will be provided at the completion of the review.

The proposed timetable for the investigation is:

Action	Timetable
Release of issues paper	18 December 2003
Submissions due	27 February 2004
Public hearing	March 2004
Final report	June 2004

Please note that the above dates are indicative and may be subject to change.

1.2 Submissions

This Issues Paper is intended to help interested parties prepare submissions to this investigation. The paper outlines the Tribunal's approach to price setting and touches on some of the key issues and options that will be considered during the investigation. The issues raised in this paper are those the Tribunal considers to be relevant for assessing appropriate pricing structures. However, the Tribunal welcomes submissions on issues relevant to pricing structure that interested parties believe should be addressed.

2 WATER CONSUMPTION AND PRICING IN SYDNEY

2.1 Supply demand imbalance

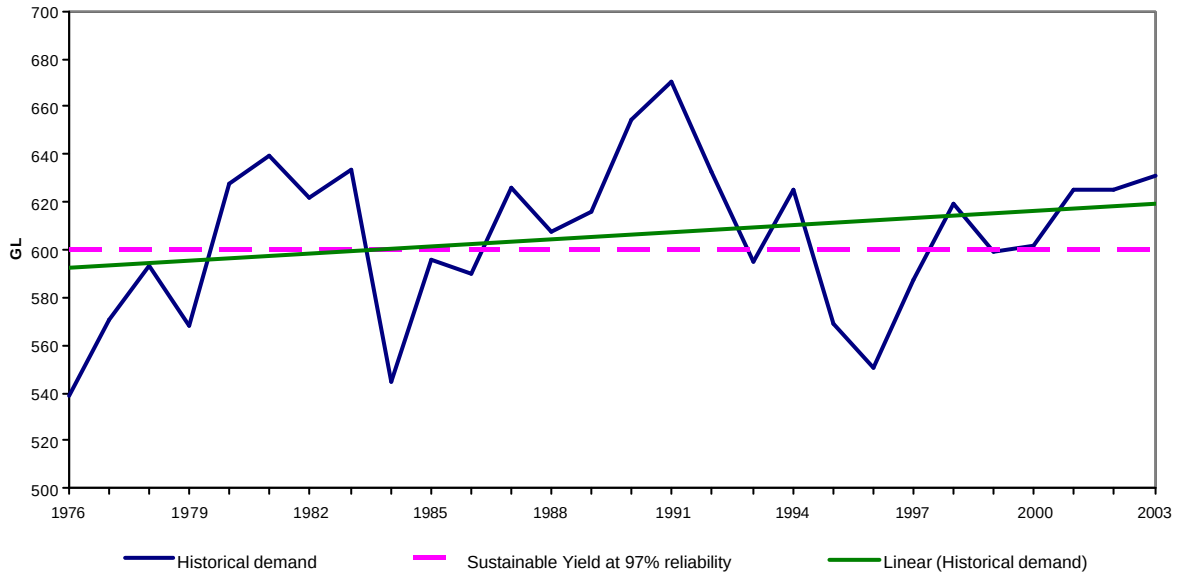
Sydney is facing a potential water supply shortfall. Demand for water in Sydney is outstripping the sustainable supply available under current water supply system performance standards. In 2002/03 Sydney Water drew 105 per cent of the sustainable annual yield[1] of the supply infrastructure.[2] Population growth and any increased environmental flows to stressed rivers within the Sydney Catchment are likely to make this imbalance even greater in the near future.

The traditional response to increasing demand and population growth has been to build another dam. The New South Wales Government has ruled this option out for the foreseeable future on environmental grounds.

The Government and its agencies are therefore working to address the supply/demand imbalance through a range of policy and practical responses. These include demand management programs which seek to limit consumption, reduction of leakage, and securing additional supplies by, for example, rainwater capture within the urban area.

Figure 2.1 shows the total draw of water by Sydney Water for each year since 1976, together with the current estimate of catchment sustainable yield and a long term trend line of total draw from 1976 to 2003.

Figure 2.1 Total volume drawn – Sydney Water Corporation



Source: Sydney Water Corporation AIR 2002/03, SCA, IPART calculations.

1 Sydney's sustainable yield is nominated by the SCA to be 600GL per annum. See section 2.5 for more details.

2 Total water supplied in 2002/03 by SCA to all customers (not just Sydney Water) was 106 per cent of the sustainable annual yield.

2.2 The regulated businesses

Responsibility for supply of potable water in the Sydney Basin is divided between the SCA and Sydney Water. The SCA manages the water catchments to ensure water quality and supplies bulk water to Sydney Water from a system of dams and other infrastructure. Sydney Water is responsible for filtration and delivery of potable water and the transport and treatment of wastewater.

2.2.1 Sydney Catchment Authority

The SCA was established to manage water supply and protect catchments, supply bulk water and regulate activities within Sydney's catchment areas to improve water quality, protect public health and the environment. It has primary responsibility for Sydney's bulk water supply, which is drawn from the catchments of four major river systems – the Warragamba, Upper Nepean, Woronora and Shoalhaven.

The SCA supplies high quality bulk (wholesale) water to Sydney Water and other large customers. The NSW Government created the SCA through the *Sydney Water Catchment Management Act 1998*, in response to the Sydney Water Inquiry headed by Peter McClellan QC (the McClellan Inquiry). The Authority became operational on 2 July 1999.

The SCA must comply with, and be audited by the Tribunal against, an Operating Licence issued by the NSW Government. The Licence sets standards and obligations on aspects of the SCA's operations, such as bulk water quality, catchment management, customer service and management of catchment infrastructure. The Operating Licence also sets security of supply standards which limit the frequency and duration of water restrictions which, in turn, impact on calculation of the sustainable yield.

The Tribunal sets SCA prices using a form of incentive regulation known as CPI±X price regulation. This broadly means that prices are adjusted for inflation (changes in the Consumer Price Index) and expected productivity improvements (the X-factor). This form of regulation was used by the Tribunal in 2000 to determine a 5-year price path for the SCA.

2.2.2 Sydney Water Corporation

Sydney Water is the largest water agency regulated by the Tribunal, providing services to a population of around 4 million in Sydney, the Blue Mountains and Illawarra regions. Sydney Water purchases its bulk water from the SCA.

In 1995, the Sydney Water Board was corporatised, to form Sydney Water, a state owned corporation under the *State Owned Corporations Act 1989*. Under Section 21 of the *Sydney Water Act 1994*, the Corporation has three principal objectives:

- to be a successful business
- to protect the environment
- to protect public health.

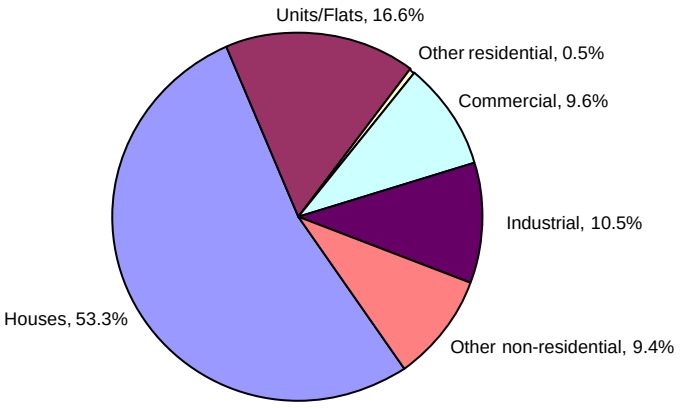
To promote these objectives and to prevent abuses of Sydney Water's monopoly position, the NSW Government issued Sydney Water an Operating Licence. The Licence sets minimum performance standards for Sydney Water and places obligations on the corporation with respect to customer service, system performance and environmental performance; including demand management targets. The Tribunal is responsible for annual audits of Sydney Water's compliance with its Licence. Large financial and other penalties can be imposed for breaches of the Licence.

In 2003, the Tribunal set maximum prices Sydney Water can charge for water supply, wastewater and stormwater services using CPI±X regulation for the period 1 July 2003 to 30 June 2005. The Tribunal decided to limit Sydney Water's current price path to a period of two years due to significant uncertainties in the operational and regulatory environment Sydney Water was facing.

2.3 Water use patterns

The uses of water are wide and varied. Apart from a few recycled water schemes, all water supplied by Sydney Water is treated to a uniform potable or drinkable standard although only a very small proportion[3] of this is actually used for human consumption. Figure 2.2 indicates the proportion of water supplied by Sydney Water to different customer categories. It shows that the residential sector (Houses, Units/Flats and Other Residential in Figure 2.2) uses approximately 70 per cent of the water supplied by Sydney Water.

Figure 2.2 Breakdown of Water Usage - Sydney Water Corporation 2002/03



Source: Sydney Water Corporation AIR 2002/03.

Water consumed by the residential sector can be broadly divided into discretionary and non-discretionary consumption.

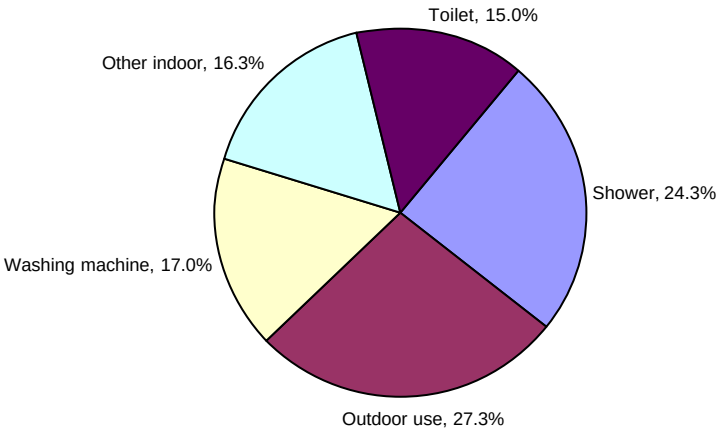
[3] The U.S. EPA estimates that approximately 0.2 per cent of total household water is used for drinking and cooking. Source: Van Der Leeden, F., Troise, F.L. and Todd, D.K. 1990. *The Water Encyclopedia,* Lewis Publishers, Inc., Second Edition.

Non-discretionary water use refers to the use of water for basic needs. Most of the water used for health and hygiene, including cooking, bathing, cleaning (eg, washing machines) and drinking, as well as water used in toilets, falls into this category. Non-discretionary water use is generally assumed to be fairly constant and is not significantly influenced by external factors such as the weather. The nature of non-discretionary water consumption suggests that higher prices are less likely to reduce consumption in the short term, although it may be influenced by usage decisions such as duration of showers and the water efficiency of appliances purchased.

Discretionary water use is less important in terms of meeting basic needs. Water used for watering lawns and gardens, swimming pools, washing cars and other forms of outdoor cleaning are the main forms of discretionary water use. Discretionary use may fluctuate, depending upon a range of factors such as income and weather conditions and restrictions on use. Price increases may be more likely to reduce some discretionary water consumption[4].

Figure 2.3 provides an indication of the types of residential water usage in the area supplied by Sydney Water.

Figure 2.3 Breakdown of Residential Water Usage - Sydney Water Corporation



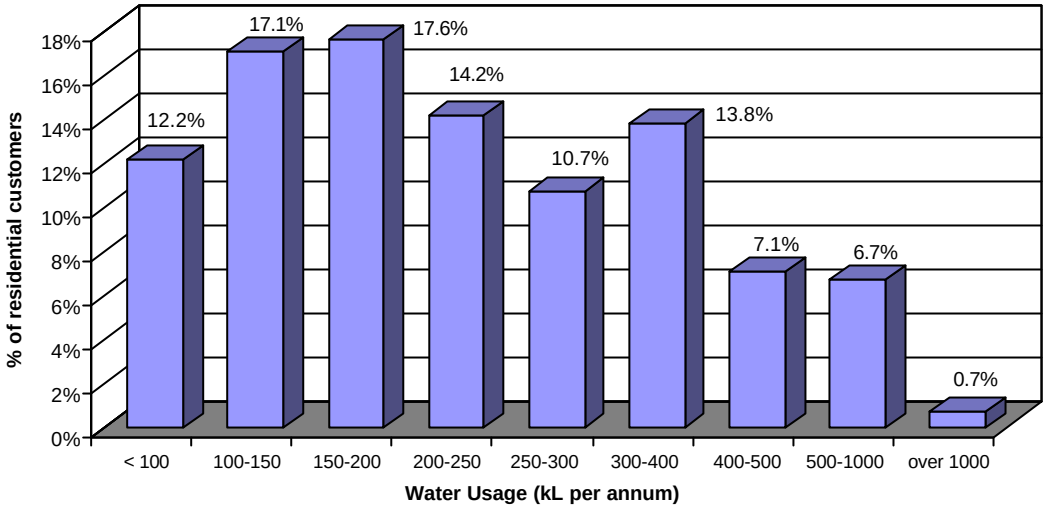
Source: Adapted from Sydney Water Operating Licence Reports to Licence Regulator, 1 September 2003.

The total quantity of water consumed by a household will be influenced by a number of factors including house type, number of occupants, garden characteristics (type, size and infrastructure eg, pool), appliance efficiency and water use habits of the occupants.

Figure 2.4 shows the distribution of residential water usage for Sydney Water customers. It indicates that almost 18 per cent of residential customers use 150-200kL of water per annum, and that over 60 per cent use less than 250kL per annum. Average residential consumption is 245kL per annum, with those in houses consuming an average of 285kL per annum and residents in units/flats consuming an average of 179kL per annum.

4 Gracia, Valinas and Martinez-Espineira, 2001.

Figure 2.4 Distribution of Residential Water Usage - Sydney Water Corporation



Source: Sydney Water Corporation 2002/03.

While it is relatively easy to analyse the nature of water use within the residential sector, the volume and types of water consumption by the non-residential sector are much more diverse. The large range of consumption levels in the non-residential sector means that it is extremely difficult to identify an 'average' non-residential customer or to identify the distribution of non-residential water usage in a similar fashion to that presented in Figure 2.4.

It is also difficult to readily distinguish between consumption for discretionary and non-discretionary purposes in the non-residential sector. This presents difficulties in formulating a pricing structure which is designed to target discretionary water use generally.

2.4 A brief history of water pricing

In 1992, the pricing structures of the metropolitan water retailers now regulated by the Tribunal comprised a mixture of components including property-based charges, pre-paid water allowances, fixed charges and usage charges.

In 1993, the Government Pricing Tribunal (predecessor to IPART) conducted an inquiry into the pricing of water and related services.

Key recommendations from this inquiry that have been implemented in subsequent pricing determinations include:

- two-part tariffs, incorporating a fixed component and a component that varies with usage
- cost reflective pricing - linking prices paid by customers to the cost of service delivery
- the removal of cross subsidies between different customer classes and types of services
- removal of property value based charges (progressively from 1993/94 for Sydney Water) in favour of user based charges for all services and
- removal of all pre-paid water allowances (in 2000).

The 1993 Inquiry recommended that a revenue cap per property be used because of concerns that a price cap would not give the regulated businesses enough incentive to pursue demand management. However, a direct price cap was retained for Sydney Water, partly due to a desire to directly drive price structure reforms.

The Tribunal has generally retained 'postage stamp' pricing for the metropolitan water businesses it regulates, with all customer classes paying the same price for a service, disregarding variations in the cost of service delivery between different parts of the supply network. It is noted, however, that in 2000 the Tribunal accepted a proposal from Hunter Water Corporation to provide a small and variable discount to very large customers on water use above 50,000kL per annum which reflected regional variation in the extent of delivery assets used by these customers.

Figure 2.5 and Table 2.1 below show the changes in the composition of an average Sydney residential household water bill (excluding wastewater) since the implementation of two-part tariffs in 1993. It shows the increasing emphasis on water usage charges, and a reduction in the value of access charges over time.

Figure 2.5 Average annual residential household water bill (2002 dollars, 250kL consumption) – Sydney Water Corporation

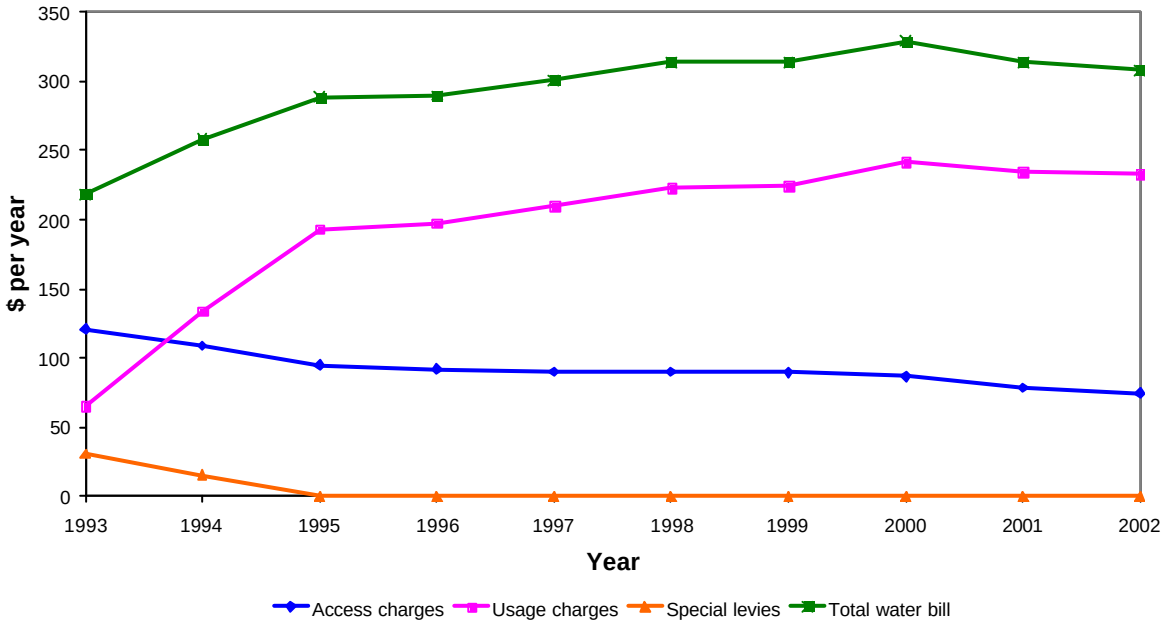


Table 2.1 Water Charges - Sydney Water Corporation ($ of the day)[1]

	Fixed access charge $	Usage charge $
1995/96	80.00	0.69
1996/97	80.00	0.75
1997/98	80.00	0.79
1998/99	80.00	0.80
1999/00	80.00	0.89
2000/01	76.25	0.91
2001/02	75.00	0.93
2002/03	75.00	0.94
2003/04	76.55	0.98

Note:

1. Data up to 2002/03 sourced from: Sydney Water AIR 2002/03. Data for 2003/04 sourced from: IPART, *Sydney Water Corporation - Prices of Water Supply, Wastewater and Stormwater Services, from 1 July 2003 to 30 June 2005.*

2.5 Demand management overview

Demand management programs are a tool to constrain water consumption. Sydney Water's Demand Management Strategy has been in place since 1995 and was revised in 1999. The Strategy has included a range of programs targeting different customer groups. The most successful programs (in terms of water saved) have been the residential retrofit program, the leakage reduction program and water recycling at Sewerage Treatment Plants. Estimates of the cost of the programs and water saved are provided in Table 2.2 below.

Table 2.2 Sydney Water's expenditure on demand management and savings achieved[1]

Program	98/99 ($m)	99/00 ($m)	00/01 ($m)	01/02 ($m)	02/03 ($m)	Total outlay ($m)	Estimated savings (GL)
Residential	0.05	4.23	10.95	6.52	7.80	29.55	7.25
Business		1.15	1.00	0.46	1.80	4.41	1.88
Leakage reduction		0.30	1.00	2.37	1.90	5.57	10.22
Recycled water					0.23	0.23	14.57
Other		0.45	1.41	1.99	0.80	4.65	-
Total	**0.05**	**6.13**	**14.36**	**11.34**	**12.53[2]**	**44.41**	**33.93**

Notes:

1 Data up to 2001/02 sourced from: IPART, *Mid-term Review of Sydney Water's Demand Management Strategy*, Montgomery Watson Harza, July 2002. Data for 2002/03 sourced from: *Water Conservation & Recycling Implementation Report 2002-03,* Sydney Water Corporation.

2. This figure excludes $7.3M capex for the BHP Wollongong recycling project.

Demand management targets for water conservation purposes were first included in Sydney Water's 1995 Operating Licence. The current Licence requires Sydney Water to meet the following target levels:

- 364 litres per capita per day by 2004/05
- 329 litres per capita per day by 2010/11.[5]

The success of Sydney Water's demand management programs was reviewed by Montgomery Watson Harza (MWH) as part of the mid-term review of Sydney Water's Operating Licence (July 2002). MWH's key findings in relation to the demand management performance were that Sydney Water:

- did not begin to implement initiatives under a formal Demand Management Program until 1999/00, as indicated in Table 2.2 (prior to this time, it relied on the introduction of quarterly billing, a two-part tariff and temporary water restrictions to manage demand)
- achieved savings of approximately 22GL per annum between June 1999 and June 2002, largely through its residential retrofit and leakage reduction programs and through water recycling at its Sewerage Treatment Plants.[6]

MWH recognised that there was scope for Sydney Water to achieve further reductions in water conservation through its demand management efforts.

Sydney's sustainable annual yield is nominated by the SCA to be 600GL per annum.[7] Based on current total demand of approximately 625GL per annum, Sydney Water needs to achieve additional savings in the order of at least 25GL per annum to meet the sustainable yield. However, assuming continued population growth and the possibility of additional environmental flows for catchment rivers, the gap between available supply and demand is likely to grow.

Although this review is focussing on reducing demand through pricing structures, any pricing strategy to achieve this end needs to be a part of a broader policy, operational and educational response which addresses demand management and supply options.

---

5 Sydney Water, *Operating Licence*, clause 8.1.1.

6 Overall the per capita demand for Sydney has fallen from the baseline of 506 Lcd in 1991 to 411 Lcd in 2002, a reduction of 18.6 per cent.

7 SCA, *Annual Report,* 2001/02. This estimate is based on applying conditions in the SCA's Licence that limit the frequency, duration and severity of restrictions. 600GL per annum is the sustainable yield at 97 per cent reliability, however these conditions are currently being reviewed as part of the Tribunal's end of term review of the SCA's Operating Licence. If the conditions change to allow increased restrictions more often, the safe yield may increase.

3 IPART'S APPROACH TO THIS REVIEW

This chapter discusses the key issues that the Tribunal will take into account in conducting this investigation. These include the requirements of its Act, the Terms of Reference for this investigation, the approach it has taken to water pricing to date and some economic principles and considerations that are relevant. It also explains how this investigation will relate to the Tribunal's periodic water pricing role.

3.1 The Tribunal's task

The challenge for the Tribunal is to develop price structures that:

- reduce demand for water by sending stronger price signals to water users
- protect vulnerable customers from unreasonable prices
- are easy to implement and administer.

The Tribunal will consider the structure of the prices paid by Sydney Water for water purchased from the SCA – the wholesale price structure – and the prices paid by end use customers (both residential and non-residential) who purchase water from Sydney Water– the retail price structure.

Analysis of retail price structures

The Tribunal will investigate alternative retail price structures, including inclining block tariffs, to assess their capacity to deliver water savings and their likely affordability impacts. This investigation will draw upon the Tribunal's established approach to retail water pricing, information drawn from a survey of household water use, broader water pricing principles and information from stakeholders. Two of the alternatives considered will be inclining block tariffs and lower fixed water charges.

A wholesale step price

The Tribunal will also investigate the use of a step price for extractions of water that exceed the sustainable yield of Sydney's catchment. These 'extractions' refer to the water that Sydney Water takes from the SCA to sell to its customers. The purpose of this part of the review is to investigate the likely effectiveness and appropriate level for a wholesale step price intended to reduce demand for water in the Sydney Basin.

3.2 The Tribunal's approach to water pricing

When setting prices for water businesses the Tribunal takes a wide range of considerations into account, as required by the *Independent Pricing and Regulatory Tribunal Act 1992* (the IPART Act).

A critical element of the price setting process is determining the revenue requirement of the regulated businesses. This is based on an analysis of the efficient operating and capital costs the business should incur to provide appropriate levels of service during the price path period.

Prices are then set to collect this level of revenue for the water business. Therefore, whilst consideration will be given in the current investigation to appropriate price structures, principles, and potential customer impacts, final price setting cannot occur until the revenue requirement of each business is known. This, in turn, will only be determined after consideration of agency and stakeholder submissions, an independent review of operating and capital costs and extensive analysis.

The current review will report on the appropriateness, potential effectiveness and likely impacts of alternative pricing structures. The Tribunal will then apply this analysis to future price determinations.

3.2.1 Requirements of the IPART Act

In its periodic price-setting role for water, the Tribunal is always guided by the requirements of the IPART Act. Section 15 of the IPART Act requires the Tribunal to consider a range of matters in making its pricing decisions. These can be grouped as follows:

Consumer Protection

- protecting consumers from abuses of monopoly power
- standards of quality, reliability and safety of the services concerned
- social impact of decisions
- effect on inflation.

Economic efficiency

- greater efficiency in the supply of services
- the need to promote competition
- effect of functions being carried out by another body.

Financial viability

- rate of return on public sector assets including dividend requirements
- impact on pricing of borrowing, capital and dividend requirements of agencies.

Environmental

- promotion of ecologically sustainable development via appropriate pricing policies
- considerations of demand management and least cost planning.

3.2.2 Customer impacts

Any movement to alternative water price structures has the potential to impact adversely on some customers. For vulnerable customer groups these impacts could be excessive. The Terms of Reference for this review specifically nominate equity and affordability for different customer groups as matters requiring particular attention from the Tribunal.

2003 IPART household survey

The Tribunal will use the results of a household survey that it conducted in 2003 as a tool to assess the potential impacts of alternative price structures on customer groups, including pensioners, low-income households and large households. The household survey will provide detailed information on consumption of water, gas and electricity, and other household characteristics.

The Tribunal commissioned previous household surveys in 1993 and 1996. These surveys collected quantitative information such as household income, household size, appliance ownership and usage, and qualitative information such as willingness to pay for 'green' energy and satisfaction with utility suppliers. Respondents were also asked to give the Tribunal access to their water (1993 only), electricity and gas billing information. This enabled the Tribunal to match survey data with actual usage for each household.

The 2003 survey repeated key questions of the earlier surveys regarding household characteristics, appliance ownership and usage, with some important additions including:

- questions on knowledge and use of concessions and other assistance schemes
- more detailed information on a sample of specifically low-income households, which will give the Tribunal a better understanding of the usage patterns of different groups within this category.

Whilst the results of the 2003 survey are not yet available it is anticipated they will be available to assist the Tribunal to analyse and consider price structure options in the later stages of this investigation.

Transition arrangements

If a new price structure is to be implemented, the Tribunal will need to consider a number of transitional issues to capture the benefits of change without causing unreasonable impacts for customers.

A key issue for the Tribunal will be the speed of price structure changes. A quick transition to a new water price structure might be useful in sending a strong signal to customers about the need to conserve water, rather than having a series of minor price changes that could go relatively unnoticed. On the other hand, a quick change could have the disadvantage of creating a price 'shock' for customers, especially if customers have not had fair warning about new prices (so that they can alter their behaviour to avoid higher water bills).

3.2.3 CoAG pricing principles

In undertaking this inquiry the Tribunal is required to give consideration to pricing principles agreed by the Council of Australian Governments (CoAG). These principles were developed by Federal and State governments from 1994, through the CoAG, as part of a national framework of water reform.

The CoAG water reform framework required governments to implement two-part water pricing, comprising an access charge and a charge to reflect usage, by no later than 1998. However, exemptions to two-part pricing could be obtained if it could be shown that adoption would not be cost effective. Prices were to be set to recover all costs, including externality costs (as defined) and to ensure the viability of water businesses.

The CoAG framework also requires full cost recovery for water and wastewater service pricing and removal of, or making transparent, any cross subsidies.

3.3 Theoretical considerations

The Tribunal's analysis of water pricing options will consider some key economic principles. The following discussion provides a basis for some of the preliminary analysis contained in this issues paper.

3.3.1 Efficiency and marginal costs

Economic theory suggests that the efficient price for a given product equals its marginal cost - the cost of producing an additional unit of that product. This price is efficient because it encourages an optimal allocation of resources in the economy via the signals that it sends to consumers and producers.

Firstly, marginal cost pricing makes consumers aware of the economic costs of their consumption, so they can make purchasing decisions accordingly. In the present case, the theory assumes that people will consume more and more water until the price of additional water outweighs the benefits. For this to be efficient, the price paid by the consumer should be equal to the marginal cost of water supply. If the regulated price is higher than the economic cost, then customers will stop buying water at a point where the marginal benefits still outweigh the marginal costs, which is not efficient.

Secondly, marginal cost pricing encourages efficient investment in production (supply). Economic theory assumes that water retailers will continue to supply water until the cost of supplying additional water outweighs the expected revenue from customers. For this to be efficient, the price received by the supplier should be equal to the marginal cost of water supply. If the price is too low, suppliers will stop providing water at a point where the marginal economic benefits still outweigh the marginal costs.

The major difficulty with applying this concept to water is that marginal costs in water are often dependent on the capacity of large, indivisible capital investments such as dams. Once the cost of building a dam has been incurred, the *marginal costs* of supplying water are very low, often so low that marginal costs are always below the *average cost* of supply. In this situation, the water business will never recover its economic costs. This trend is only broken when the dam's supply capacity is reached, at which time a new capital investment(s) is

made. This new investment may be more expensive, which might cause an increase in marginal costs.

This problem may be addressed by setting prices at long run marginal cost (LRMC) instead of short run marginal cost (SRMC). SRMC is only the direct cost of additional supply – eg, the cost of collecting one more kL of water in a dam and transporting it to a consumer. LRMC is the SRMC plus an amount to reflect the costs of the next capital investment that will be needed to augment supply – an event that comes closer and closer as each additional kL of water from existing sources is consumed.

Estimation of a LRMC price can incorporate environmental, social and political factors. In order to attach a price for future supply augmentation, optimal augmentation strategies must be identified, which can take account of social and political constraints by excluding unacceptable strategies. LRMC should also include environmental costs associated with consumption patterns and supply augmentation. Environmental costs are as valid as any explicit monetary costs, and recognising environmental costs in water prices is integral to optimal water use.

The apparent comprehensiveness of LRMC also makes it very difficult to calculate. LRMC must estimate growth in future demand for water, and then find the most efficient way to meet this demand. This task involves estimating the costs associated with the many demand management and supply augmentation options that may be available. Environmental costs associated with the available options may be particularly uncertain.

The theoretical efficiency arguments that support LRMC pricing must be balanced against these and other considerations. The Tribunal may move away from strict LRMC prices, but only if the associated loss of efficiency is outweighed by other benefits. The Tribunal noted in 1993 that "the practical application of these (pricing) principles must balance efficiency gains against administrative costs and distributional impacts."

3.3.2 Elasticity

Price elasticity of demand (PED) measures the percentage change in quantity demanded (eg, quantity of water used) which is brought about by a change in price. Where a small change in price results in a large change in the quantity demanded, demand is said to be elastic. Where a small increase in price has little to no impact on the quantity demanded, demand is said to be inelastic. The extreme examples are perfect elasticity (where a rise in price will reduce the quantity demanded to zero) and zero elasticity (where demand is constant regardless of changes in price).

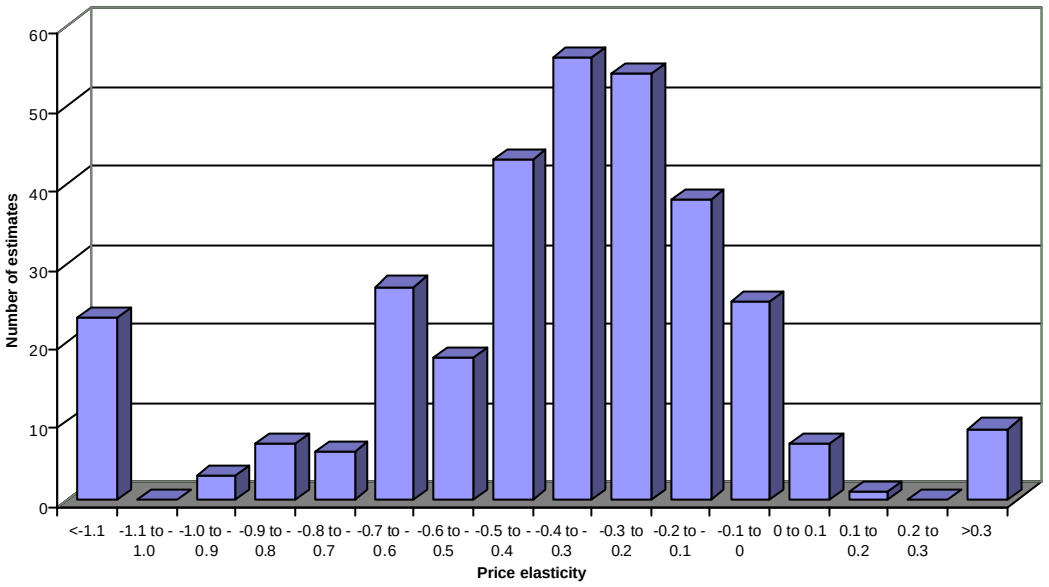
The magnitude of PED is crucial to the question of the extent to which pricing policies can achieve positive outcomes by changing consumer behaviour. Much of the discussion in this issues paper refers to potential movements in water consumption caused by changes in prices and price structures, and the economic (including environmental) benefits or costs that result from these movements. Prices are signals to consumers, but these signals will only affect consumer behaviour to the extent that demand is elastic.

Estimates of PED will help the Tribunal to determine how price changes should be used to alter water consumption in NSW. The PED will estimate the magnitude of price changes that would be necessary to alter consumption. The Tribunal can then decide whether such changes would be appropriate in the context of its broader regulatory objectives.

Empirical evidence - International

Figure 3.1 below has been adapted from PED literature. It compares 317 estimates of price elasticity for water from 54 studies around the world. Estimates and methodologies have varied considerably, but most estimates of elasticity are within the range -0.7 to zero.[8] This means that the PED for water is inelastic.

Figure 3.1 International estimates of elasticity for water



Source: Adapted from dataset of Dalhuisen et al, 2000, Thomas et al, 1983, Metropolitan Water Authority, 1985, and AATSE and IE Australia, 1999.

However, many economists argue that PED varies according to more specific variables, such as:

- the type of water use - outdoor water use has generally been found to be more elastic than indoor water use[9]
- seasonal demand – some studies have found that winter demand is less elastic than summer demand[10]
- long run vs. short run - Carver and Boland (1980) argue that the PED for water may be greater in the long run than the short run, because price information takes time to flow through to consumers, and consumers take time to invest in water saving (eg, purchasing a water-efficient washing machine).

Empirical evidence – Australia

Estimates of PED may vary significantly between locations due to differences in affluence, climate and other factors. There are few estimates of the PED for water in the Sydney region, so the Tribunal may need to draw some conclusions from international studies in considering PED for water in Sydney.

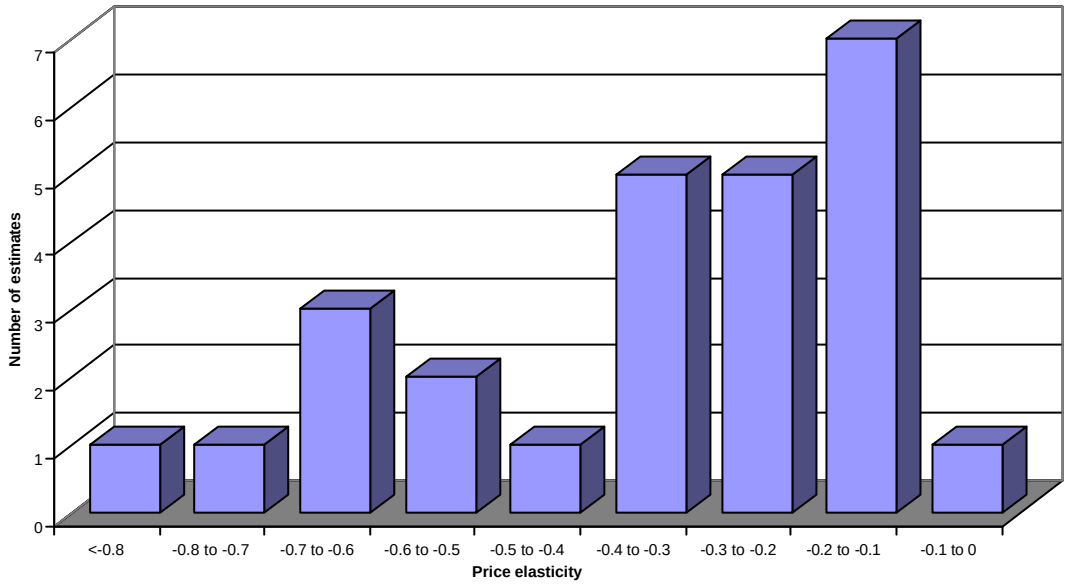
8 Elasticity is usually expressed as a negative number, because it is showing the percentage change in demand when price goes up by 1 per cent. For example, a PED of -0.06 means that a 1 per cent price rise will reduce demand by just 0.06 per cent. A PED of -2 would mean that a 1 per cent price rise would reduce demand by 2 per cent.

9 Gracia, Valinas and Martinez-Espineira, 2001.

10 Michelsen, et al, 1998.

Figure 3.2 below compares PED estimates for areas which have broadly similar water supply conditions to Sydney. Areas such as Cape Town (South Africa) and Los Angeles (California) have previously been nominated as having similar conditions to Sydney, because they have high rainfall variability, multi-year water storage and exposure to extended droughts.[11] The graph below includes PED estimates from 3 studies in California, a study in Miami, and Australian studies in Adelaide, Perth, and the Hunter region of NSW. The literature shows that most price elasticity estimates for these areas are in the range -0.4 to 0.

Figure 3.2 Estimates of elasticity for water for cities with similar water supply conditions to Sydney



Source: Adapted from dataset of Dalhuisen et al, 2000, Thomas et al, 1983, Metropolitan Water Authority, 1985, and AATSE and IE Australia, 1999.

The study that appears most directly relevant to the Tribunal's considerations is that of Warner (1996). Warner used two models for the purposes of estimating the demand for water in the Sydney region, with similar results. He found that the PED for water in Sydney was -0.1266 under the first model, and -0.1242 under the second. These results suggest that a 10 per cent increase in the price of water in Sydney would cause a 1.3 per cent reduction in the total quantity of water used. These estimates are consistent with the results presented in Figure 3.2.

Warner's estimate of PED is only a point estimate and is likely to change depending upon current consumption levels and the magnitude of any contemplated price change. However, in the absence of other directly relevant studies it may provide a good approximation for the purposes of initial modelling.

[11] Prepared for IPART by Sinclair Knight Merz, *Review of the Performance Criteria in SCA's Operating Licence - Final Report*, 2003.

Practical considerations for elasticity

Aside from estimating PED for retail water, the Tribunal must be confident that consumers will understand the impacts of alternative price structures. Combining the introduction of new price structures with a publicity campaign may be necessary to increase consumer awareness and achieve reductions in demand.

4 RETAIL PRICE STRUCTURE OPTIONS

In order to facilitate discussion about pricing structures the Tribunal has conducted some investigation and preliminary analysis of a range of alternative retail price structures, including some modelling to assess:

- what alternative price structures might look like
- the likely effectiveness of alternative price structures in reducing demand and
- how the alternatives might affect different customer groups.

This analysis is for illustrative purposes only and is based on Sydney Water's revenue requirement in 2003. Sydney Water's revenue requirement is likely to change, particularly if a wholesale step price is introduced, so the prices below are therefore unlikely to be applicable when the Tribunal next sets prices in 2005. Three scenarios are outlined in detail below and Appendix 2 outlines 6 additional scenarios.

Scenario 1: a higher usage charge offset by a removal of the fixed access charge, so that customer water bills are more directly linked to the amount of water used.

Scenario 2: an 'inclining-block tariff', where customers initially pay a low (Tier 1) usage charge, but then pay a higher (Tier 2) usage charge after a usage quantity of 400 kilolitres per annum (kL/pa) is reached (the step quantity).

Scenario 3: the same structure as Scenario 2, but the Tier 2 usage charge applies after consumption of 300kL/pa.

The following table summarises the analysis of these options to date:

Table 4.1 Summary of initial scenarios

Scenario	Fixed access charge	Tier 1 usage charge	Tier 2 usage charge	Step quantity	Effect on total water consumption[1,2]	
					Average price response	*Marginal price response*
Current Prices						
	$76.55	$0.98	n.a.	n.a.	n.a.	n.a.
Increased usage pricing						
1	$0.00 (-100%)	$1.30/kL (+33%)	n.a.	n.a.	-9.65GL/pa	-24.35GL/pa
Inclining-block tariff						
2	$57.41 (-25%)	$0.98/kL (0%)	$1.75/kL	400kL	-9.84GL/pa	-25.24GL/pa
3	$57.41 (-25%)	$0.98/kL (0%)	$1.45/kL	300kL	-8.85GL/pa	-24.93GL/pa

Notes:
1 The difference between the average price response and the marginal price response is explained in section 4.1.2 below.
2. These estimates include the effect on both residential and non-residential customers.

It is noted that these are only a few of the alternative price structure options that could be considered. These options have been chosen, in part, to illustrate some options that have been raised in public discussion.

Some other options are discussed at Section 4.4 and some further variants of these scenarios are outlined in Appendix 2. The Tribunal is interested in receiving submissions on all price structure options.

Figure 4.1 below summarises the likely impacts of these three alternative scenarios on residential customers.

Figure 4.1 Residential bill impact analysis

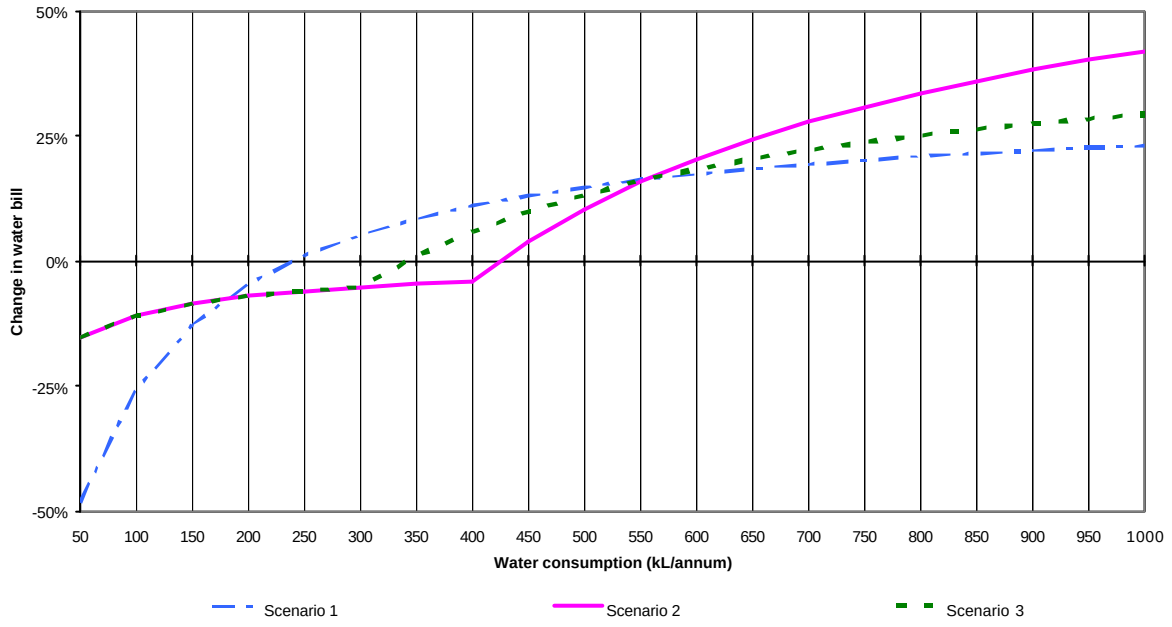


Figure 4.1 shows that all three options penalise high water users by increasing the size of their bills (Figure 2.4 illustrates the distribution of water use by residential customers). The kinks in the curves of scenarios 2 and 3 show the effect of the step in inclining block tariffs. Customers below the step quantity receive a saving on their bill, but the majority of those who use above the step quantity would receive higher total bills than they would at present.

These options illustrate some of the trade offs that are inherent in considering alternative price structures. Whilst the Tribunal's initial modelling indicates that all may result in broadly similar levels of water savings the price impacts on customers differ significantly. These customer impacts are illustrated in more detail in Figures 4.2, 4.4 and 4.5

Scenario 1, removal of the fixed charge, results in significant savings to customers with low levels of water consumption and comparatively more modest increases in price for high volume water users.

Scenario 2, an inclining block tariff with a 400kL/pa step point, results in modest bill reductions for the majority of consumers, including many with above average consumption[12], but significant increases for very high volume water users.

Scenario 3, an inclining block tariff with a 300kL/pa step point, also results in bill reductions for the majority of customers but increased bills would affect a greater proportion of customers than in Scenario 2. As the number of customers paying a Tier 2 price for some of their water consumption is greater than with Scenario 2, the Tier 2 price would be lower ($1.45 rather than $1.75).

The customer impacts of these scenarios are further analysed and discussed in Sections 4.2 and 4.3 of this Paper.

4.1 Preliminary modelling

4.1.1 Overview

The following sections contain preliminary modelling of the possible impact of some alternative pricing structures on:

- the total demand for water in the Sydney Basin
- Sydney Water's revenue, and
- customers' water bills.

The following scenarios offer some insight into alternative pricing options, but stakeholders should be aware that they are only a guide to the potential structures and impacts. Therefore, each of the scenarios presented below show what the price restructure would have looked like had it been implemented at the 2003 determination, assuming no change in Sydney Water's revenue requirement as determined at that time.

The Tribunal is likely to develop more sophisticated models for its final report. The preliminary models were based upon data collected from Sydney Water. The Tribunal anticipates that final models will include data from the recent Household Survey, which will allow a more detailed analysis of individual household characteristics and the likely effects of price structure changes.

Non-residential customers

Much of the discussion below focuses on residential customers, but the Tribunal must also consider the likely impacts of price structure reforms on commercial and industrial customers. Currently, these non-residential customers are charged a flat per kL water usage charge and a fixed access charge, with the access charge proportionate to the size of the meter servicing the property.

[12] Average residential consumption is 245kL per annum, with those in houses consuming an average of 285kL per annum and residents in units/flats consuming an average of 179kL per annum.

Adapting alternative price structures for non-residential customers is a complex task. This group of customers is much more diverse than residential households, which presents difficulties for the Tribunal in analysing the potential impact of a pricing scenario or alternative pricing regimes on a 'typical' non-residential customer. There may not be a 'typical' non-residential customer upon which meaningful comparisons can be made.

While price changes will affect demand for water in the non-residential sector to some extent, precise estimates of this effect are difficult because there are fewer studies of demand available for this sector than for residential customers. The Tribunal has prepared preliminary models for this paper for discussion purposes.

The Tribunal considers that there may be practical limitations to the implementation of some of the possible price structures, such as inclining-block tariffs, for commercial and industrial customers. It has included discussion of the potential limitations, and would appreciate comments on the most appropriate price structure for commercial and industrial customers.

4.1.2 Assumptions

Average price vs. marginal price

The Tribunal's research into price elasticity of demand revealed debate about whether customers respond to average prices or marginal prices.[13]

The difference between the two approaches is explained as follows:

- The use of marginal prices is a direct application of economic theory. Theory states that a rational consumer would buy water up to the point where the marginal cost of water was equal to the marginal benefit that they receive from consuming that water – ie the decision to buy more water would be based on the marginal price.
- However, some studies have found that customers' consumption is responsive to average prices rather than marginal prices[14]. This approach assumes that customers look at the total of their periodic bills and decide whether to use more or less water on the basis of this one (average) price signal, rather than breaking their bill down into components and considering the marginal price effects.

It is not clear whether Sydney Water's customers respond to average prices or marginal prices, but the distinction is very important. Preliminary modelling suggests that if customers respond to marginal prices, then the impact of alternative price structures on water consumption may be substantial. If customers respond to average prices, changes in demand are likely to be relatively subdued.

The modelling below indicates both average prices and marginal prices responses.

---

13 The marginal price of water is the price of the *next* amount to be used.

14 Chicoine et al, 1986, Billings and Day, 1989, Nieswiadomy, 1992 and Stevens et al, 1992 and 1993, each concluded that when making decisions about how much water to consume, people did not react to marginal price but actually based their decisions on the average price. The average price of water is calculated by dividing the total water bill by the number of kL of water consumed during the period.

Price Elasticity of Demand

Table 4.2 shows the Price Elasticity of Demand assumptions for residential customers which have been used by the Tribunal to generate the scenarios presented. It indicates that for a 1.0 per cent increase in the average price of water, low water consumers will reduce the quantity of water that they purchase by between 0.01 and 0.05 per cent, medium water users will reduce their consumption by approximately 0.2 per cent and high water users by 0.3 per cent.

Table 4.2 Elasticity assumptions

Consumption	Elasticity
kL <100	-0.01
kL 100-150	-0.05
kL 150-200	-0.1
kL 200-250	-0.1
kL 250-300	-0.2
kL 300-400	-0.2
kL 400-500	-0.3
kL 500-1000	-0.3
kL >1000	-0.3

The Tribunal is assuming that customers who use low volumes of water (<150kL per annum) are using most of that water for non-discretionary purposes - health and hygiene - and are therefore unlikely to significantly change their consumption in response to price changes.

When weighted by the proportion of customers in each cohort, the above elasticity range translates to an average elasticity of approximately -0.13 per cent, which is in line with Warner (1996).

The Tribunal's research has not provided any clear indication as to what the PED for non-residential customers might be. For modelling purposes, the Tribunal has assumed that all non-residential customers have a PED of -0.13, regardless of their consumption level.

Revenue neutrality

Each of the scenarios presented broadly maintains revenue neutrality. For modelling purposes it is assumed that each of the price scenarios was implemented at the 2003 price determination with the revenue requirement established at that time. Sydney Water's revenue requirement for the 2005 price path is not yet known - any decision to implement price structure reforms in the future would need to consider the future revenue requirement.

Assumptions about marginal versus average price have a significant impact on the level of revenue earned by Sydney Water under each of the scenarios presented. Where Sydney Water's customers make consumption decisions based upon marginal price, the reduction in demand in the residential sector is likely to be larger and the resulting loss of revenue more pronounced. However, the decline in revenue from the residential sector may be offset by a corresponding increase in revenue from higher water charges for extremely large non-residential customers.

Estimating customer impacts

When faced with an increase in their water bill, customers have the choice to either moderate their water consumption or to accept a higher total bill for the water they consume. In each of the scenarios presented, the Tribunal has attempted to estimate the range of customer impacts which may result. The residential and non-residential customer impact analysis presented in Figures 4.2 through 4.7 indicates the customer impacts that would occur if consumers decide not to reduce their consumption in response to each modelled price increase.

4.2 Increased usage pricing – Scenario 1

4.2.1 Description

The first option is to remove or reduce the existing fixed access charge and to offset lost revenue by increasing the existing water usage charge. The cost per kL of water would be constant for all customers at all usage levels. This approach would align retail water bills more closely with water usage.

The cities of Sydney, Melbourne and Brisbane currently apply a two-part tariff price structure with a single usage charge per kL of water consumed.

4.2.2 Customer and demand impacts

The Tribunal has analysed the following scenario which illustrates the effect of removing the fixed access charge and increasing the water usage charge. It gives an overview of the changes which would occur to the current pricing regime under this scenario.

The fixed access charge would be removed entirely under this scenario. The water usage charge is increased from $0.98 per kL to $1.30 per kL to make up for lost revenue for Sydney Water.

Table 4.3 shows the key variables for this scenario.

Table 4.3 Scenario 1

Variable	
- Fixed charge (pa)	$0.00
- Water usage price/kL	$1.30
Residential demand savings (pa)	
- Change in residential water cons (GL) using average price	-6.90
- Change in residential water cons (GL) using marginal price	-20.62

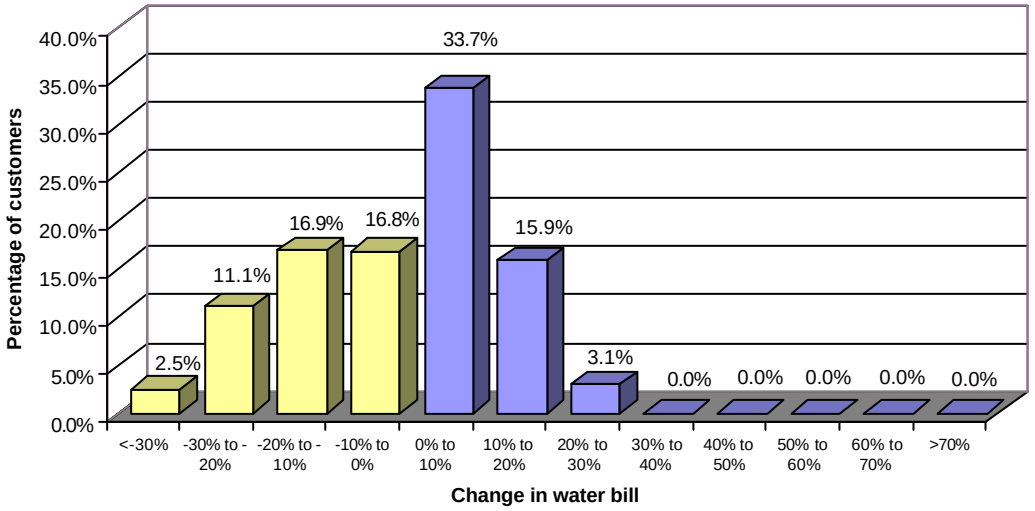
Under Scenario 1, the Tribunal's preliminary analysis indicates that residential consumers will reduce consumption by approximately 6.90GL per annum, assuming they respond to changes in average price. If consumers respond to changes in marginal price, consumption will be reduced by approximately 20.62GL per annum. This analysis assumes revenue neutrality for the average price model, however if customers respond to marginal price, then these prices will result in decreased revenue to Sydney Water.

Analysis of potential customer impacts is presented in Table 4.4 below:

Table 4.4 Impact analysis – Increased usage pricing - Scenario 1

kL/annum	Current water bill $	Bill under Scenario 1 $	% change
50	125.55	65.00	-48.2
100	174.55	130.00	-25.5
150	223.55	195.00	-12.8
200	272.55	260.00	-4.6
250	321.55	325.00	1.1
300	370.55	390.00	5.2
350	419.55	455.00	8.4
400	468.55	520.00	11.0
450	517.55	585.00	13.0
500	566.55	650.00	14.7
550	615.55	715.00	16.2
600	664.55	780.00	17.4
650	713.55	845.00	18.4
700	762.55	910.00	19.3
750	811.55	975.00	20.1
800	860.55	1,040.00	20.9
850	909.55	1,105.00	21.5
900	958.55	1,170.00	22.1
950	1,007.55	1,235.00	22.6
1000	1,056.55	1,300.00	23.0

Figure 4.2 Residential bill impact analysis – Increased usage pricing - Scenario 1



4.2.3 Key issues

1. *Greater incentive for all customers to reduce their water usage*

The existing two-part tariff price structure encourages water conservation, but a price structure that relies more heavily or totally on usage charges will make the price incentive stronger. Customers who use large volumes of water would be required to pay significantly more than they do at present, while low volume water users would pay less. Importantly, however, all users, including low volume users, would gain financially from reducing consumption. The extent of these effects will vary with the extent to which the access charge is decreased and the usage charge is increased.

2. *Efficient pricing if usage charge is based on LRMC*

The water usage charge can be based on the long run marginal cost, which is a theoretically efficient price. Although the LRMC has not been calculated recently (it represents a range of augmentation options) this price structure enables all water use to be charged at the same rate.

3. *No penalty price for wasting water*

Retaining a single usage charge means that all forms of water use are priced equally. This approach may be perceived as unfair to some users, because high water use by some customers drives the price up for all customers.

In practice, it is difficult to assess whether a particular level of consumption is 'excessive' or not – it depends on the characteristics of each household. Preventing usage perceived as wasteful might be better dealt with by other regulatory instruments such as restrictions and building design rules.

4. *Consistent*

A uniform water usage charge allows consistency in structure between (and within) both the residential and non-residential sectors. Customers would not be charged different prices for the same good.

5. *Large families may pay more for water*

A heavier usage charge for water will affect all households that use above average quantities of water, which means that the water bill for some large households may rise. This effect is more pronounced as the usage charge increases. This may have adverse social impacts, especially given that large families may have limited scope to reduce their demand. The impacts of this are likely to be more widely spread than the impacts arising from an inclining-block tariff. Conversely, with this structure there will be more significant average price reductions for low volume users.

6. *Greater revenue volatility for agency*

Revenue will be more closely related to demand under this model, because the moderating effect of the fixed access charge is reduced or removed. Events beyond the control of Sydney Water, such as a year with a lot of rain, may reduce total revenue quite substantially. The need to manage demand fluctuations within the regulatory framework will be more pronounced.

7. Easy to understand

A greater emphasis on usage prices would be easily understood by customers. It is a simple case of 'paying for what you use', and (unlike multi-tiered price structures) the price of water is always known by the customer at the time of consumption. This is important if customers are expected to respond to price changes.

8. Implementation would be simpler than other options

Changing the balance of fixed and usage charges is administratively simple when compared to the other options. Metering systems and billing formats could remain largely as they are, and any new price structure would be at least as simple as the one currently in use. A move to this form of price structure would be simpler than the alternatives.

4.2.4 Commercial and industrial customers

Increased usage pricing ensures that commercial and industrial customers are not faced with a price structure which is significantly different to that faced by the residential sector. The Tribunal has previously tried to avoid differences between the price structures for each customer group in order to avoid development of inappropriate cross subsidies.

The problems associated with partial or complete removal of the fixed access charge and an offsetting increase in the water usage charge for the non-residential sector are identical to those already discussed in the context of residential customers. Such a proposal will result in some customers receiving a substantially reduced water bill (where the fixed access charge represents a larger proportion of a consumers total bill than the water usage component) while large water users may face substantial increases in their water bills. At present the access charge paid by non residential customers is related to the size of the meter connection.

The following analysis presents an overview of the potential impact of Scenario 1 on total water charges for non-residential customers set out according to meter size. Non-residential customers may have more than one water meter - in such cases the effect on total water bills may be different from that shown in the chart.

Figure 4.3 shows the distribution of bill impacts by meter size resulting from Scenario 1, removing access charges and increasing the usage price to $1.30. Figure 4.3 indicates that under this scenario:

- Charges for approximately 43 per cent of all non-residential services will increase by between 0.0 and 30.0 per cent.
- Charges for approximately 33 per cent of all non-residential services are likely to decrease by between 30.0 and 40.0 per cent.

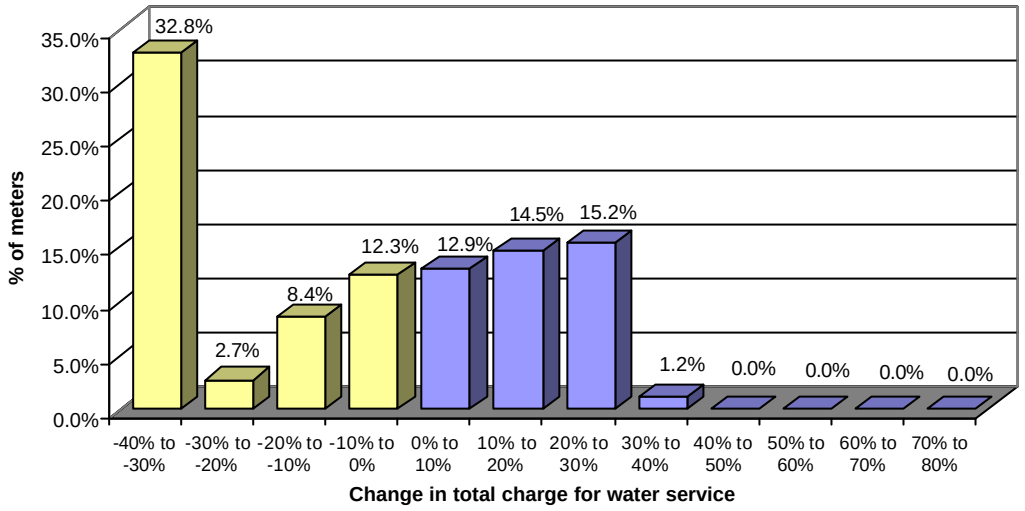
The size of the likely demand savings from the non-residential sector which will result from Scenario 1 will depend largely upon whether non-residential customers make decisions about water consumption based upon marginal or average price.

Table 4.5 shows the potential demand savings from the non-residential sector resulting from Scenario 1.

Table 4.5 Non-residential demand savings – Scenario 1

Price specification	GL/pa
- Change in water cons using average price	-2.75
- Change in water cons using marginal price	-3.73

Figure 4.3 Non-residential impact analysis – Increased usage pricing - Scenario 1



4.3 Inclining-block tariff – Scenarios 2 and 3

4.3.1 Description

Under inclining-block pricing, customers are charged an initial per kL price[15] for water usage up to a predetermined level (the 'step quantity'). For water use in excess of the step quantity, customers are charged a higher usage price.[16] More 'steps' may be added as quantity increases, if desired.

The inclining-block tariff price structure provided as an example by this paper is an extension of the current two-part pricing regime. The difference is that the water usage charge does not remain constant for all levels of water usage. As with a standard two-part tariff, all customers' water bills will increase in line with water consumption, but the effect is more pronounced for high water users.

In Australia, two-tier inclining-block tariffs are used in Canberra and Adelaide, while Western Australia has a more complex nine-tier inclining-block structure.

In order to remain revenue neutral when consumers respond to average price, the scenarios below all include some reduction in the access charge.

15 This initial price is typically referred to as the 'Tier 1' usage price and is expressed in cents per kL.

16 Typically referred to as the 'Tier 2' or 'step' price.

4.3.2 Customer and demand impacts

Each of the following inclining-block tariff scenarios reflect options about the volume of water that will be charged at the Tier 1 water usage price, the quantum of the access charge and, consequently, the Tier 2 price. For these two scenarios the Tribunal has assumed that the Tier 1 price would not be reduced.

For discussion purposes the Tribunal has presented two inclining-block tariff scenarios. The first assumes the step quantity will be set at 400kL per annum and the second assumes that the step quantity is set at 300kL per annum.

By changing the step point from 400kL per annum to 300kL the proportion of all residential customers (those living in both houses and apartments) who consume at least some water at the Tier 2 price increases from approximately 13.5 per cent to 27.5 per cent.

Scenario 2

The first inclining-block tariff scenario is a modest deviation from the current two-part tariff pricing regime. Under Scenario 2, the fixed access charge would be reduced to three quarters of its current level ($57.41) and the resulting loss of revenue would be compensated for by setting the Tier 2 water usage price to $1.75 per kL with no change in the Tier 1 water usage price.

Scenario 2 assumes the following changes to the current two-part tariff regime:

- the fixed access charge is reduced from $76.55 per annum to $57.41
- the Tier 1 water usage charge remains unchanged at $0.98 per kL
- the Tier 2 water usage price is set at $1.75 per kL, and
- the step quantity is set at 400kL per annum.

Table 4.6 provides an overview of the scenario variables.

Table 4.6 Scenario 2

Variable	
- Fixed charge (pa)	$57.41
- Tier 1 price per kL	$0.98
- Tier 2 price per kL	$1.75
- Step quantity (kL)	400
Residential demand savings (pa)	
- Change in residential water cons (GL) using average price	-4.64
- Change in residential water cons (GL) using marginal price	-18.41

Under the assumptions outlined above, the Tribunal's preliminary analysis indicates that residential consumers will reduce consumption by approximately 4.64GL per annum, with little or no change in total revenue when consumers respond to average price. Under this scenario, and assuming no change in Sydney Water's revenue requirement, approximately 87 per cent of residential customers would receive reduced water bills.

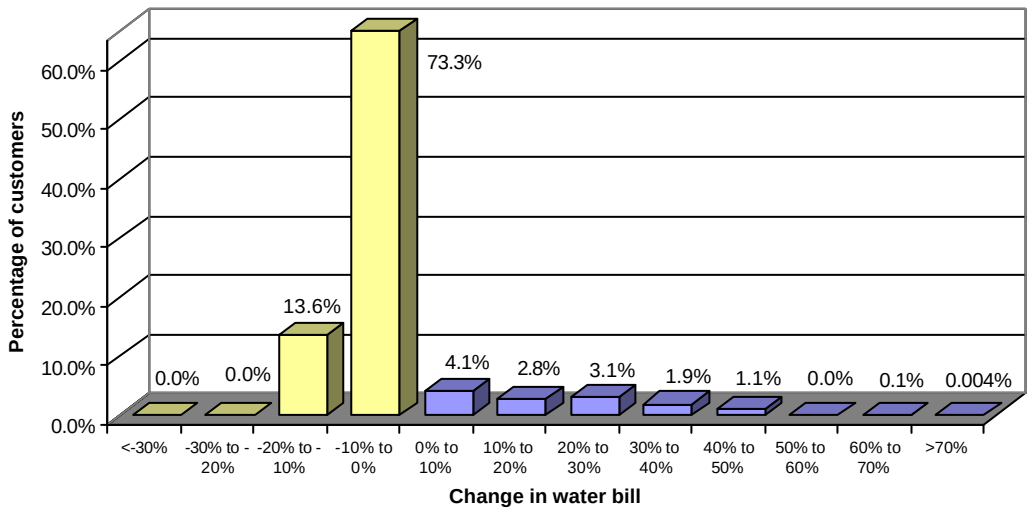
If consumers are assumed to respond to marginal price, then for the above prices, consumption will decrease by approximately 18.41GL per annum and total revenue would fall.

Potential customer impacts are presented in Table 4.7 below.

Table 4.7 Impact analysis – Inclining-block tariff - Scenario 2

kL/annum	Current water bill $	New water bill $	% change
50	125.55	106.41	-15.2
100	174.55	155.41	-11.0
150	223.55	204.41	-8.6
200	272.55	253.41	-7.0
250	321.55	302.41	-6.0
300	370.55	351.41	-5.2
350	419.55	400.41	-4.6
400	468.55	449.41	-4.1
450	517.55	536.91	3.7
500	566.55	624.41	10.2
550	615.55	711.91	15.7
600	664.55	799.41	20.3
650	713.55	886.91	24.3
700	762.55	974.41	27.8
750	811.55	1,061.91	30.8
800	860.55	1,149.41	33.6
850	909.55	1,236.91	36.0
900	958.55	1,324.41	38.2
950	1,007.55	1,411.91	40.1
1000	1,056.55	1,499.41	41.9

Figure 4.4 Residential bill impact analysis – Inclining-block tariff - Scenario 2



Scenario 3

Under Scenario 3, the fixed access charge would be reduced to 75 per cent of its current level ($54.71 per annum) and the resulting loss of revenue would be offset by an increase in the Tier 2 water usage price but there would again be no change in the Tier 1 water usage price.

Scenario 3 assumes the following changes to the current two-part tariff regime:

- the fixed access charge is reduced from $76.55 per annum to $57.41 per annum
- the Tier 1 water usage charge remains unchanged at $0.98 per kL
- the Tier 2 water usage price is set at $1.45 per kL
- the step quantity is set at 300kL per annum.

Table 4.8 provides an overview of the scenario variables.

Table 4.8 Scenario 3

Variable	
- Fixed charge (pa)	$57.41
- Tier 1 price per kL	$0.98
- Tier 2 price per kL	$1.45
- Step quantity (kL)	300
Residential demand savings (pa)	
- Change in residential water cons (GL) using average price	-5.16
- Change in residential water cons (GL) using marginal price	-20.15

Under the assumptions outlined above, the Tribunal's preliminary analysis indicates that if consumers respond to average price they will reduce consumption by approximately 5.16GL per annum with little or no change in total revenue. Under this scenario, and assuming no change in Sydney Water's revenue requirement approximately 72 per cent of residential customers would receive reduced water bills.

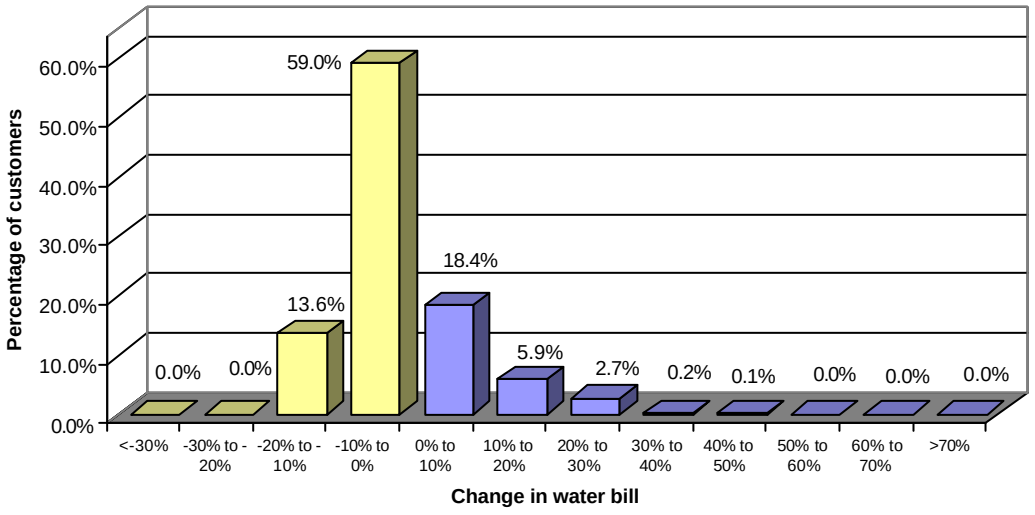
If consumers respond to marginal price then they will reduce consumption by 20.15GL per annum, at these prices, and total revenue would fall.

Potential customer impacts are presented in Table 4.9 below.

Table 4.9 Impact analysis – Inclining-block tariff - Scenario 3

kL/annum	Current water bill $	New water bill $	% change
50	125.55	106.41	-15.2
100	174.55	155.41	-11.0
150	223.55	204.41	-8.6
200	272.55	253.41	-7.0
250	321.55	302.41	-6.0
300	370.55	351.41	-5.2
350	419.55	423.91	1.0
400	468.55	496.41	5.9
450	517.55	568.91	9.9
500	566.55	641.41	13.2
550	615.55	713.91	16.0
600	664.55	786.41	18.3
650	713.55	858.91	20.4
700	762.55	931.41	22.1
750	811.55	1,003.91	23.7
800	860.55	1,076.41	25.1
850	909.55	1,148.91	26.3
900	958.55	1,221.41	27.4
950	1,007.55	1,293.91	28.4
1000	1,056.55	1,366.41	29.3

Figure 4.5 Residential bill impact analysis – Inclining-block tariff - Scenario 3



4.3.3 Key Issues

1. Water conservation signal to customers

An inclining-block tariff structure sends a stronger water conservation signal to customers whose consumption is above the step quantity. Consumption beyond a certain point is penalised by a higher per kL usage price, so heavy users have an incentive to moderate their water use to avoid paying the higher price.

2. Cost of water supply is not shared equally

An inclining-block price structure creates a situation in which the cost burden of water supply is not shared equally amongst all customers. Some consumers pay more for a kL of water than others, even though the product is the same. Effectively, extra revenue collected through the Tier 2 price is used as a subsidy for low volume water users.

In contrast, a single usage price shares the total cost burden of all water sources amongst all customers.

3. Large families may be penalised

The application of step quantities to each water bill means that large families may have less water available per person at the Tier 1 price. A large family taking all possible measures to minimise their water consumption may find they are penalised for some of their usage, while someone living in a small home unit making no attempt to conserve water may never face the higher prices associated with higher consumption.

This may create adverse social impacts. More information is needed on the possible extent of this problem, and measures to mitigate it.

4. Limited incentive for low water users to save more water

An inclining-block tariff structure will not increase the incentive for customers using less water than the step quantity to save water. These users may receive a reduction in their overall water bill, and they are unlikely to face the increases in marginal price associated with higher blocks.

Compared with a single higher usage charge, this structure will provide smaller rewards to small volume customers who take steps to reduce consumption in line with community concerns to be more careful with water. The retention of a relatively high fixed access charge and low Tier 1 price moderates the water bill savings for these customers.

5. Complexity

The number of variables involved with inclining-block tariffs makes this structure complex. Decisions about the Tier 1 and Tier 2 usage prices, the step quantity and the fixed access charge can not be made in isolation - these variables are interrelated.

Trying to reduce this complexity can reduce the usefulness of the inclining-block structure. For example, the use of a single step (rather than a series of steps) makes the proposal simpler, but it limits the options available for allocating costs of water supply amongst high water users.

Customers may have difficulty understanding their bills and managing their consumption.

6. SRMC and LRMC have not been calculated for retail water in Sydney

The Tribunal does not have a precise calculation of SRMC and LRMC for retail water in Sydney. Any calculation of these concepts may need to take account of practical considerations that the Tribunal will have in the next price review.

7. Billing of properties without individual meters

Many apartments and some other properties do not have individual water meters. Rather, the consumption from a common meter is allocated amongst individual properties. Depending on the meter size and price step point, dividing the Tier 1 and Tier 2 charges amongst individual properties equitably may be a significant challenge.

8. Frequency of billing for customers

The choice of billing period will affect the price incentives for consumers.

If the step quantity is calculated on an annual basis, the impact of many customers' usage above the step quantity would be felt in the final quarter of the billing year; which may be in winter. This increases the complexity for customers seeking to manage their consumption and bill size.

If the step quantity is calculated on a quarterly basis, some customers may find that although their total usage across four quarters would be below the annual step quantity, their usage in one particular quarter may be above the step quantity. Given water use is generally higher in the hot summer months, this could become a form of seasonal pricing potentially resulting in a much greater proportion of customers paying the Tier 2 price for part of the year.

4.3.4 Commercial and industrial customers

The above discussion of inclining-block tariff price structures is focussed on reducing the water consumption of the residential sector. There is a strong argument for maintaining consistency in pricing approach across both the residential and non-residential sector. This would indicate the application of an inclining-block tariff to commercial and industrial customers.

The Tribunal is open to suggestion as to firstly, whether or not an inclining-block price structure should be applied to both commercial and industrial customers and if so, how such a price structure could be applied. Following are two options for dealing with the non-residential sector in the event that a residential inclining-block tariff price structure is implemented.

Option 1

The first possible approach would be to introduce inclining block tariffs with the same Tier 1 and Tier 2 prices as the residential sector. However, the step point would be related to the customer's meter size and access charge in recognition of the higher access charges paid by non-residential customers with larger meters. Therefore, in order to calculate the appropriate step quantity for meter sizes greater than 20mm, the following formula would be applied:

$$\text{Step quantity} = (\text{meter size})^2/400 \times (\text{20mm step quantity})$$

Applying this approach for the non-residential sector to the two inclining-block tariff scenarios discussed above would result in the following bill impacts for non-residential customers.

Scenario 2

Under inclining-block tariff Scenario 2, the non-residential (or 20mm) step quantity is set at 400kL per annum. Therefore, applying the above formula results in the following step quantities for meter sizes above 20mm.

Table 4.10 Step quantity for non-residential customers (400kL step for 20mm meter)

Meter size	Step quantity (kL annum)
20mm	400
25mm	625
30mm	900
40mm	1,600
50mm	2,500
80mm	6,400
100mm	10,000
150mm	22,500
200mm	40,000
250mm	62,500
300mm	90,000
For meter diameter sizes not specified above, the following formula applies	$=(\text{meter size})^2/400 \times 400$

Figure 4.6 shows the distribution of bill impacts by meter size resulting from Scenario 2, which incorporates a reduction in the fixed access charge to three quarters its current level, a $0.98 per kL Tier 1 usage price and a $1.75 per kL Tier 2 usage price. Figure 4.6 demonstrates that under Scenario 2:

- Charges for the majority of non-residential services will decrease by between 0.0 and 20.0 per cent.
- Charges for a small percentage of non-residential services are likely to increase significantly, possibly by as much as 50.0 to 70.0 per cent.

The magnitude of demand savings from Scenario 2 will depend upon whether non-residential customers respond to the marginal price or the average price.

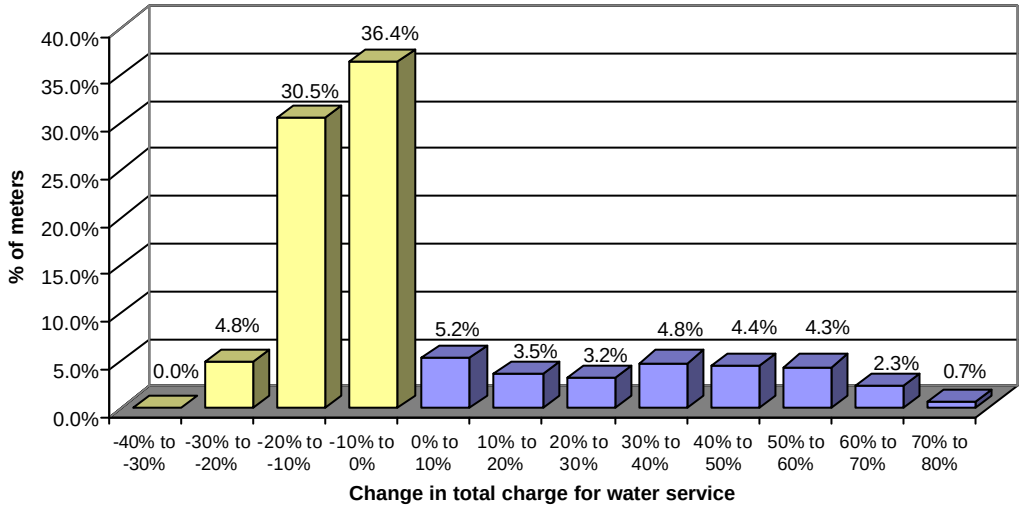
Table 4.11 shows the potential demand savings from the non-residential sector arising from Scenario 2.

Table 4.11 Non-residential demand savings – Scenario 2

Price specification	GL/pa
- Change in water cons using average price	-5.20
- Change in water cons using marginal price	-6.83

It should also be noted that the scenario outlined above is likely to result in a significant increase in revenue for Sydney Water from non-residential water charges. If this approach was to be adopted more sophisticated modelling would be required in order to produce a revenue neutral result.

Figure 4.6 Non-residential impact analysis – Inclining-block tariff - Scenario 2



Scenario 3

Under inclining-block tariff Scenario 3, the non-residential (or 20mm) step quantity is set at 300kL per annum. Therefore, applying the above formula results in the following step quantities for meter sizes above 20mm.

Table 4.12 Step quantity for non-residential customers (300kL step for 20mm meter)

Meter size	Step quantity (kL annum)
20mm	300
25mm	469
30mm	675
40mm	1200
50mm	1875
80mm	4800
100mm	7500
150mm	16875
200mm	30000
250mm	46875
300mm	67500
For meter diameter sizes not specified above, the following formula applies	$=(\text{meter size})^2/400 \times 300$

Figure 4.7 shows the distribution of bill impacts by meter size resulting from Scenario 3 which consists of a reduction in fixed access charge to three quarters of its current level, a $0.98 per kL Tier 1 usage price, a $1.45 per kL Tier 2 usage price and a step quantity of 300kL for a 20mm meter. Figure 4.7 demonstrates that under Scenario 3:

- Charges for the majority of non-residential services (close to 60.0 per cent) will decrease, falling by between 0.0 and 20.0 per cent.
- Charges for approximately 33.0 per cent of non-residential services are likely to increase by between 0.0 and 40.0 per cent.

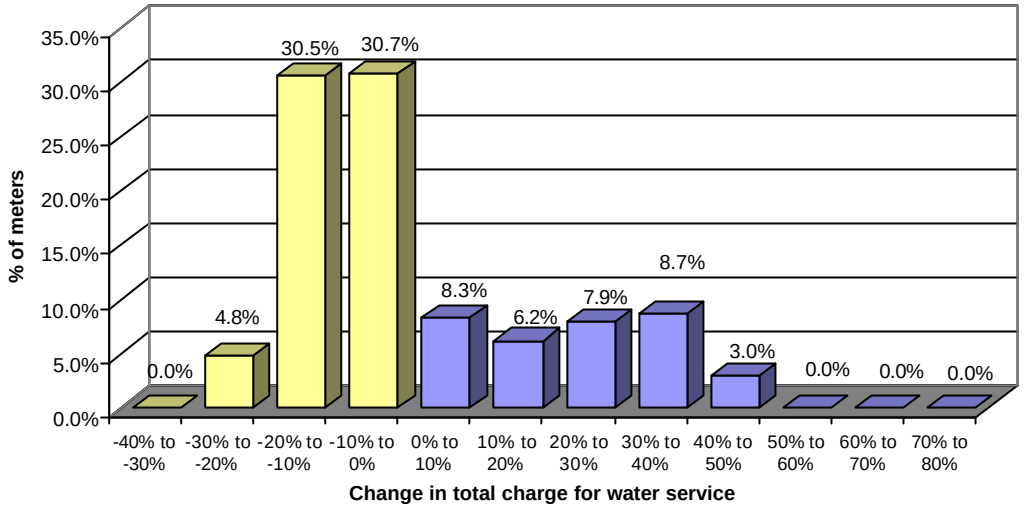
Table 4.13 shows the potential demand savings from the non-residential sector arising from Scenario 3.

Table 4.13 Non-residential demand savings – Scenario 3

Price specification	GL/pa
- Change in water cons using average price	-3.69
- Change in water cons using marginal price	-4.78

For Sydney Water, Scenario 3 could potentially result in a significant increase in revenue from non-residential water charges.

Figure 4.7 Non-residential impact analysis – Inclining-block tariff - Scenario 3



As was the case in the previous section, the following graphs present an overview of the potential impact of the above scenarios on total water bills by meter size for non-residential customers. It should be noted that non-residential customers often have more than one water meter and where this is the case the net effect on the total water bill may be different from that depicted in the chart.

There may be a number of practical limitations to the application of an inclining-block tariff to non-residential customers, such as, complexity in billing, customers with more than one meter and differential prices for similar customers.

Option 2

The second possible approach to dealing with the non-residential sector under an inclining-block tariff price regime would be to maintain both the water usage and water fixed charge at their current level. Effectively this would mean that the non-residential sector would pay relatively higher access charges offset by not having inclining-block usage charges. It would ensure minimal disruption to the non-residential sector. However, it would also result in a different price structure for residential and non-residential customers and depending upon the residential price structures chosen could result in a situation in which non-residential customers are charged a higher access charge than residential customers.

The Tribunal welcomes comments on the most appropriate way in which to deal with the non-residential sector should an inclining-block price structure be implemented for the residential sector.

4.4 Other options

Other price structures are possible that have not been explored in detail in this paper.

4.4.1 Sewerage usage charge

Introducing usage charges for sewerage services (which are linked to water use) may encourage water conservation in the same way as usage charges for water itself. This paper has focussed on water that is collected and transported to customers, but it may be valid to encourage water conservation through the prices paid by customers to get rid of water after it has been used. Larger non-residential customers currently pay for sewerage services through a combination of access and usage charges.

Metering wastewater discharges is very difficult, so usage charges for sewerage are usually estimated as a proportion of the water used by the property in question (discharge factor). At present, Sydney Water residential customers pay a fixed sewerage charge that is not linked to the volume of wastewater that the individual customer puts into the sewerage system.

The Tribunal recognises several problems with usage charges for sewerage services:

- The link between water usage and wastewater volumes is not always accurate, which undermines a system of charges based on metered water consumption. For example, customers with rainwater tanks may contribute a proportionately large amount of wastewater, relative to their metered water use. On the other hand, some businesses may use a lot of water in their production processes, but very little of this water may be put into the sewerage system.
- Differences between water use and sewerage volumes can create administrative problems. For example, the application of discharge factors can generate complaints from customers who believe that they are treated unfairly (eg, they have a lower than average contribution to sewerage volumes).
- Higher usage charging for sewerage may not be cost–reflective resulting in the introduction of inappropriate cross subsidies. Generally, the costs of wastewater infrastructure and operations are largely fixed, that is they do not vary significantly with quantity variations.

4.4.2 Seasonal pricing

Seasonal pricing is a form of peak pricing – charging higher prices to curb peaks in demand. For water, this usually means a higher price in summer - hot and dry conditions can lead Sydney residents to use more water for discretionary purposes such as watering gardens and filling swimming pools.

There are a number of conditions which determine the effectiveness of seasonal pricing. For example, seasonal pricing is generally most effective where:

- variation in demand for water between the peak and off peak periods is substantial
- peak demand is the major driver of capital investment, and
- peak demand consistently occurs during the same season.

The Tribunal recognises some practical concerns with seasonal pricing:

- In order for a seasonal pricing regime to send the appropriate pricing signals, customers must have a clear understanding of the price structure and the way in which the seasonal price will be administered.
- Seasonal pricing requires that meters are consistently read across seasons, which is not current practice. Sydney Water's meter reading and billing system may need additional capacity to deal with the complexity involved with a seasonal price structure.
- As with other user-pays pricing regimes a key concern for the Tribunal is ensuring that large low income families are not unfairly penalised for summer water use which may be of a non-discretionary nature.

The Tribunal does not have information available at this time on the effect of a seasonal tariff on demand (and therefore on revenue for Sydney Water).

5 A WHOLESALE STEP PRICE

In response to the 1998 Sydney Water Inquiry, the NSW Government created two separate bodies, one to manage the catchments and to supply bulk water (the wholesaler, SCA) and another to treat the water and supply it to the customer (the retailer, Sydney Water). Under the institutional structure, Sydney Water purchases bulk water from the SCA at a wholesale rate, as set by the Tribunal. Currently Sydney Water pays the SCA a fixed availability charge per annum and a volumetric charge for bulk water purchased from the SCA – the volumetric charge is priced at a constant rate ($/kL) for all water purchased.

The previous sections of this paper discuss the potential use of a step retail price for water and the likely incentives for retail consumers to conserve water. Another option to improve the water conservation signals is to use incentives through the wholesale price structure. Under this model Sydney Water would be provided with a financial incentive[17] to encourage water conservation by using both demand side and supply side strategies.

The Terms of Reference for the review require the Tribunal to consider the use of a step price for the bulk water purchased by Sydney Water from the SCA to provide better incentives to ensure a long term sustainable demand. The terms specifically require the Tribunal to consider the use of a step in price for water consumed above the estimated sustainable yield of the catchment.

This chapter describes some of the options for and issues with implementing a wholesale step price. The Tribunal seeks responses from stakeholders on the potential introduction of a step wholesale usage price for water sales to Sydney Water above the estimated sustainable yield of the catchment.

5.1 Description

Under a wholesale step price structure, Sydney Water would pay:

- a Tier 1 price for the first block of its water consumption up to the step quantity which would be set at the sustainable yield of the catchment, and
- a higher price – the Tier 2 price - for consumption above the step quantity.

This paper assumes only one step quantity, with two prices (for consumption above and below the step quantity respectively). Whilst it would be possible to have many step quantities and prices, it is unclear whether there are additional benefits associated with such a wholesale step price structure, given that there is only one main purchaser of bulk water from the SCA.

The Tier 2 price could effectively act as a 'penalty' price if it is set at a level which precludes Sydney Water earning a commercial return on the retail sale of water purchased above the step price. If retail customers use more water than is available within the sustainable yield, then additional revenue earned by Sydney Water would effectively be paid to the SCA through the higher Tier 2 price.

[17] If the price paid for bulk water increases there is less profit for Sydney Water from retail water sales.

5.2 Purpose

A wholesale step price might be pursued to achieve a number of different objectives. Some of these are outlined below.

Water conservation by Sydney Water

While proposals to change Sydney Water's retail price structure aim to provide incentives to customers to reduce their water use, a wholesale step price aims to increase the financial incentive for Sydney Water to engage in water saving programs. Under the current wholesale price setting approach Sydney Water earns additional revenue for each additional unit of water it sells, effectively creating a commercial incentive to sell more water. This incentive may be offset to some extent by the incentives created by other regulatory instruments such as its Operating Licence. However, a wholesale step price that is structured to remove any profit from water sales above the sustainable yield may more effectively remove the incentive.

Increasing the financial incentives for Sydney Water to engage in water conservation acknowledges that it has a unique position in the market for estimating the costs and likely effectiveness of water conservation strategies. As the manager of Sydney's water distribution infrastructure, Sydney Water has the best knowledge of infrastructure performance (eg, leakage rates) and the costs of maintaining and improving that performance. As a retailer, Sydney Water has a relationship with and knowledge of its customers, including how they are likely to respond to demand management initiatives.

Some key areas where Sydney Water is likely to have an advantage for water conservation include:

- targeting and reducing water delivery leakage
- reducing water usage in sewerage treatment processes
- conducting customer education and water use reduction targeting, and
- implementing water restrictions.

Encourage efficient wholesale supply augmentation

Demand management by Sydney Water may not be enough to keep water consumption in Sydney below the sustainable yield. If retail demand for water exceeded a step quantity/sustainable yield, then Sydney Water would have an incentive to seek supply augmentation or demand reduction where the costs are less than the Tier 2 price. In effect, the use of a Tier 2 price opens up a market for demand management and supply augmentation alternatives where these can deliver water or water savings below the Tier 2 price.

An advantage of this approach is that it allows the Tribunal to influence the appropriate level of investment in demand management and supply augmentation options. The revenue Sydney Water would have to pay the SCA for exceeding the step quantity in the absence of sufficient demand management/supply augmentation programs should reflect the maximum funds Sydney Water should direct to these programs. By increasing the Tier 2 price, the Tribunal increases the incentive on Sydney Water to invest in demand management and supply augmentation programs. Similarly, decreasing the Tier 2 price reduces the incentive faced by Sydney Water.

The flexibility created by the introduction of a Tier 2 wholesale step price allows the Tribunal at future determinations to increase or decrease the incentive placed on Sydney Water, based on an assessment of its performance at achieving demand management and sourcing alternative water supply such as recycled water. This may become increasingly important depending on the success of current programs and measures to reduce water drawn from the SCA's catchment.

5.3 Key issues

How should the step quantity be determined?

The Terms of Reference suggest that the bulk water step quantity be set equal to the sustainable yield from the Sydney Catchment as determined. The sustainable yield refers to the quantity of water that can be supplied from existing catchments on an ongoing basis. This takes account of rainfall, river flow patterns, system security operational rules, requirements for environmental flows and the point at which water is pumped or transferred from the Shoalhaven river system.

This structure should reflect the economic cost structure of water supply. Below the step quantity, water can be supplied sustainably from the existing catchment. Above the step quantity, drawing water from the existing catchment is not sustainable on an ongoing basis, and more expensive alternative sources must ultimately be found. These may be supply augmentation or demand reduction strategies, both of which have potential to bring supply and demand back into balance.

How should Tier 1 and Tier 2 prices be set?

A step price structure could use marginal cost pricing as its basis:

- **The bulk water Tier 1 price could be based on SRMC.** The SCA can supply any quantity of water up to the sustainable yield without augmenting supply. The Tribunal may need to move away from strict SRMC prices in order to meet other policy objectives (eg, financial viability for Sydney Water and SCA), but SRMC could still be the basis for Tier 1 prices.
- **The bulk water Tier 2 price could be based on LRMC.** Above the sustainable yield, prices need to reflect the full costs involved in augmenting supply and/or demand management. The LRMC could reflect these costs.

The Tribunal has not calculated a precise SRMC or LRMC for wholesale water in Sydney. However, if a new dam is not to be built in the foreseeable future, calculation of the LRMC might be based on the cost curve of demand reduction and supply augmentation options available. The quantum and timing of additional supply requirements will therefore influence the LRMC calculation.

Link to retail step prices

Attempts could be made to link directly wholesale and retail step prices. However, uncertainty about future demand for water means that retail prices cannot be set to yield a simple 'pass-through' of wholesale prices on to retail customers. Future water consumption is difficult to predict. Demand fluctuates over time in response to weather and other factors, and consumer responses to price changes and demand management initiatives are uncertain. Fluctuations in overall consumption, which may move wholesale purchases above the wholesale step point, will not necessarily be consistently reflected in movement of retail sales above a retail step point.

Having a direct link between the retail and wholesale step prices will also have the effect of reducing the incentive for Sydney Water to engage in demand management and conservation measures. Having no link between a wholesale step price and any retail step price could also have the perverse effect of resulting in Sydney Water earning additional revenue, from retail sales above a retail step point which it may be able to retain without subsequently passing it onto the SCA. This may also have the effect of reducing the incentive for Sydney Water to engage in programs to promote customers reducing water use.

Providing a broad reference rather than a direct relationship, perhaps at a price review, may ensure consistency between the two prices, whilst still providing an incentive for Sydney Water to conduct demand management and alternative supply augmentation programs during a regulatory period.

Extra revenue for Sydney Catchment Authority

The use of a step price for wholesale water raises the prospect that SCA will capture revenue above its determined revenue requirement, reflecting its need to increase the water supply available to Sydney customers. This would occur where customers (via Sydney Water) choose to pay the penalty Tier 2 wholesale price rather than curb their water use, and Sydney Water does not have alternative supply sources.

A number of measures could be used to make sure that the SCA does not retain excess revenues. These include the following options:

- First, Tier 1 and Tier 2 prices could be adjusted (down) to make sure that the minimum revenue requirement for the SCA includes a portion of sales made at the Tier 2 price (assuming this could be forecast accurately).
- Second, excess revenue could be captured in a fund, for use in encouraging supply augmentation and/or demand management.
- Third, excess revenue could be collected in the NSW Government Consolidated Fund.

If the second option is chosen, the structure to utilise the additional revenue is a matter for Government policy.

Cost and revenue implications for Sydney Water

Sydney Water's bulk water needs change every year due to a range of factors including population growth and weather. As the Tribunal sets water prices using forecast water demand, this can result in large revenue shortfalls and overruns when actual water use is markedly different from forecast. Under the existing price structures, this short run financial risk is borne by Sydney Water, however windfalls and losses are expected to balance out in the long run.

Changes to the wholesale step price may however affect this balance. Effectively, excess revenue earned when Sydney Water sells more than the sustainable yield would be passed on to the SCA through the wholesale step price. Prices are likely to be set such that Sydney Water recovers its fixed costs after selling water equivalent to the sustainable yield. In the event that water demand is lower than the sustainable yield, Sydney Water would suffer a financial loss. However, unlike the existing price structure, this would not be offset in those years where water demand exceeds sustainable yield.

The implications of a wholesale step price for cost volatility and the financial viability of Sydney Water therefore become an important part of this review and will require careful consideration by the Tribunal.

APPENDIX 1 TERMS OF REFERENCE

As a prelude to the commencement of the next periodic pricing review for Sydney Water and Sydney Catchment Authority, the Tribunal is requested to investigate and report on using pricing structures to reduce demand for water in the Sydney Basin.

This review is to cover:

- The use of a step price paid by Sydney Water to the Sydney Catchment Authority for extractions above the estimated sustainable yield of the catchment as determined from time to time.
- The establishment of pricing principles and a framework that may be adopted in moving from current retail tariff structures to alternative retail tariff structures. Pricing options for consideration should include inclining-block tariffs and reductions in fixed water charges.

In undertaking this review the Tribunal should have particular regard to:

- The potential affordability and equity impacts of alternative pricing structures, including step prices, on different customer groups.
- The potential for differential pricing for different customer classes and different end uses of water – such as industrial, commercial, residential and non-residential outdoor use.
- The likely water conservation impacts of alternative price structures.
- Water pricing principles agreed to by the Council of Australian Governments.

The Tribunal is to investigate and report by 31 July 2004.

APPENDIX 2 SUPPLEMENTARY MODELLING

The Tribunal's preliminary modelling is not limited to the three scenarios presented in Section 4. Presented below are a number of additional pricing scenarios. These scenarios cover:

- increased usage pricing
- inclining-block tariff
- seasonal pricing.

Stakeholders should be aware that these Scenarios have been presented for illustrative purposes only and are designed to give a preliminary indication as to the potential tradeoffs between prices, reductions in water demand and likely customer impacts in the residential sector.

A2.1 Scenario 4 – Increased usage pricing

A2.1.1 Scenario variables

Scenario 4 consists of a reduction in the fixed access charge to three quarters of its current level and a uniform increase in the water usage charge for all customers to $1.05 per kL.

Table A2.1 Scenario 4

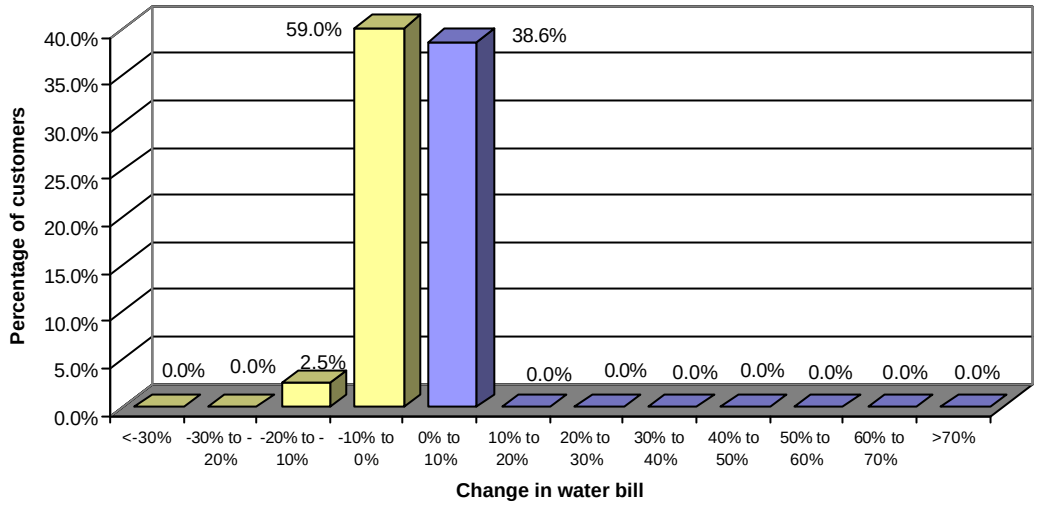
Variable	
- Fixed charge (pa)	$57.41
- Water usage price/kL	$1.05
Residential demand savings (pa)	
- Change in residential water cons (GL) using average price	-1.30
- Change in residential water cons (GL) using marginal price	-5.16

The Tribunal's preliminary modelling suggests that under Scenario 4, residential customers would reduce consumption by approximately 1.30GL per annum, assuming they respond to changes in average price. If consumers respond to changes in marginal price, consumption would be reduced by approximately 5.16GL per annum. As with previous modelling, this analysis assumes revenue neutrality for the average price model but not the marginal price model.

A2.1.2 Residential customer impact

Analysis of potential customer impacts is presented in Figure A2.1 below.

Figure A2.1 Residential customer impact analysis – Increased usage pricing Scenario 4



A2.2 Scenario 5 – Increased usage pricing

A2.2.1 Scenario variables

Scenario 5 consists of a reduction in the fixed access charge to half of its current level and a uniform increase in the water usage charge for all customers to $1.14 per kL.

Table A2.2 Scenario 5

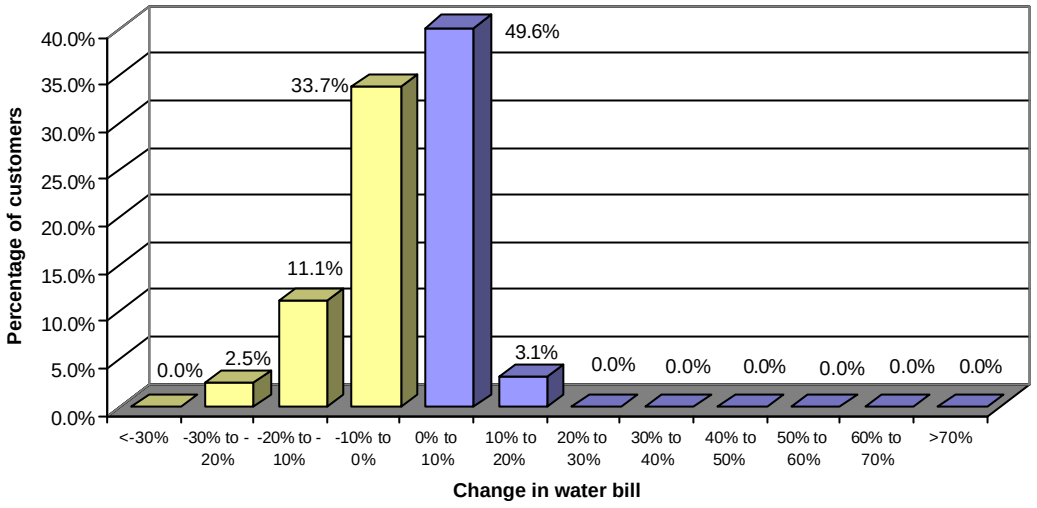
Variable	
- Fixed charge (pa)	$38.28
- Water usage price/kL	$1.14
Residential demand savings (pa)	
- Change in residential water cons (GL) using average price	-3.72
- Change in residential water cons (GL) using marginal price	-11.21

Under the assumptions outlined above, the Tribunal's preliminary modelling indicates that residential customers would reduce consumption by approximately 3.72GL per annum, assuming they respond to changes in average price and approximately 11.21GL per annum if they respond to changes in the marginal price.

A2.2.2 Residential customer impact

Analysis of potential customer impacts is presented in Figure A2.2 below.

Figure A2.2 Residential customer impact analysis – Increased usage pricing Scenario 5



A2.3 Scenario 6 – Inclining-block Tariff

A2.3.1 Scenario variables

Scenario 6 consists of a reduction in the fixed access charge to three quarters of its current level and a reduction in the Tier 1 water usage price from $0.98 per kL to $0.75 per kL for consumption below 200kL per annum. For consumption in excess of 200kL per annum the Tier 2 water usage price would increase to $1.70 per kL.

Table A2.3 Scenario 6

Variable	
- Fixed charge (pa)	$57.41
- Tier 1 price per kL	$0.75
- Tier 2 price per kL	$1.70
- Step quantity (kL)	200
Residential demand savings (pa)	
- Change in residential water cons (GL) using average price	-9.03
- Change in residential water cons (GL) using marginal price	-33.64

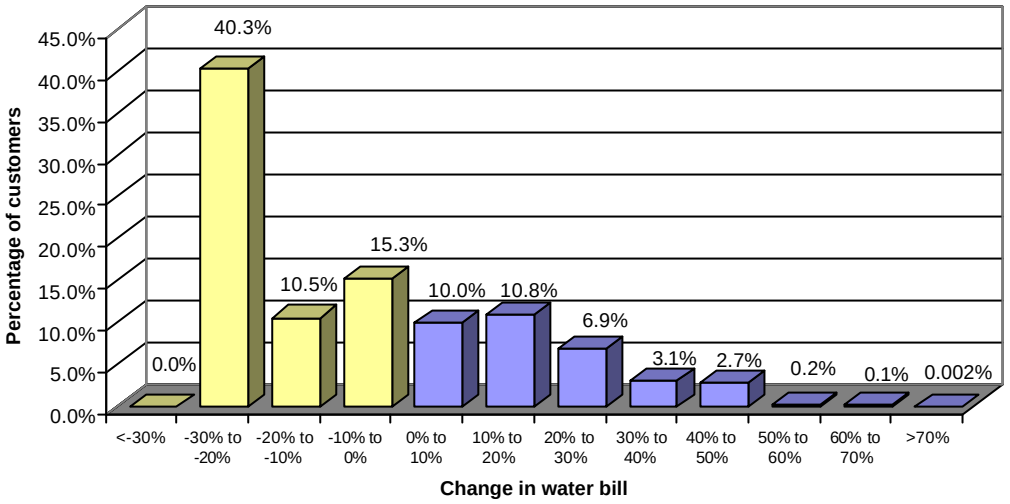
This Scenario illustrates that a lower step point necessarily increases the number of customers who are exposed to the higher Tier 2 water usage charge and substantially increases the potential demand response. Under the assumptions outlined above, the Tribunal's preliminary modelling indicates that residential customers would reduce consumption by approximately 9.03GL per annum, assuming they respond to changes in

average price and approximately 33.64GL per annum if they respond to changes in the marginal price.

A2.3.2 Residential customer impact

Analysis of potential customer impacts is presented in Figure A2.3 below.

Figure A2.3 Residential customer impact analysis – Inclining-block tariff - Scenario 6



A2.4 Scenario 7 – Inclining-block tariff

A2.4.1 Scenario variables

Scenario 7 consists of a reduction in the fixed access charge to three quarters of its current level and an increase in the water usage price from $0.98 per kL to $1.30 per kL for consumption above 250kL per annum.

Table A2.4 Scenario 7

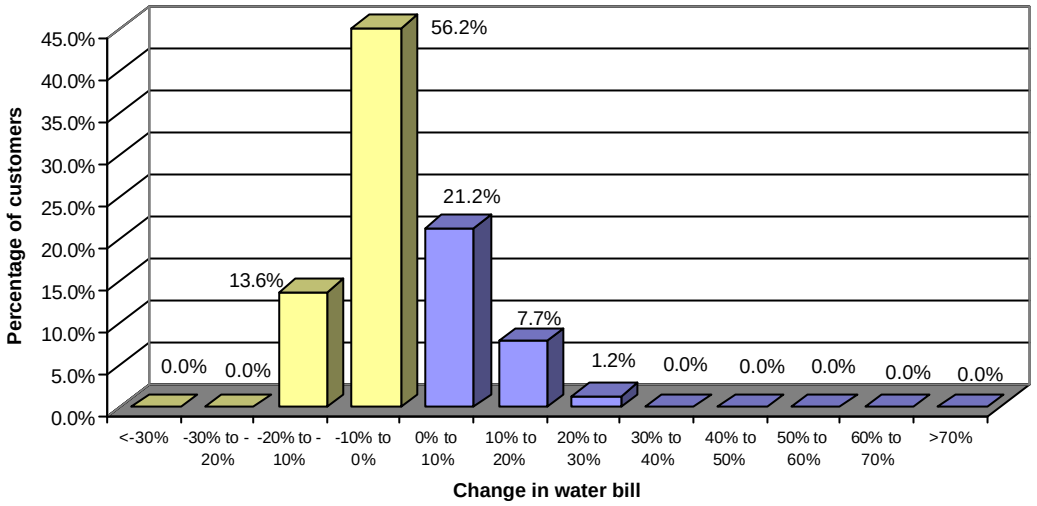
Variable	
- Fixed charge (pa)	$57.41
- Tier 1 price per kL	$0.98
- Tier 2 price per kL	$1.30
- Step quantity (kL)	250
Residential demand savings (pa)	
- Change in residential water cons (GL) using average price	-4.38
- Change in residential water cons (GL) using marginal price	-17.32

Under the assumptions outlined above, the Tribunal's preliminary modelling indicates that residential customers would reduce consumption by approximately 4.38GL per annum, assuming they respond to changes in average price and approximately 17.32GL per annum if they respond to changes in the marginal price.

A2.4.2 Residential customer impact

Analysis of potential customer impacts is presented in Figure A2.4 below.

Figure A2.4 Residential customer impact analysis – Inclining-block tariff - Scenario 7



A2.5 Scenario 8 – Inclining-block tariff

A2.5.1 Scenario variables

Scenario 8 consists of a reduction in the fixed access charge to half of its current level and an increase in the Tier 1 water usage price from $0.98 per kL to $1.05 per kL for consumption below 300kL per annum. For consumption in excess of 300kL per annum the Tier 2 water usage price would increase to $1.55 per kL.

Table A2.5 Scenario 8

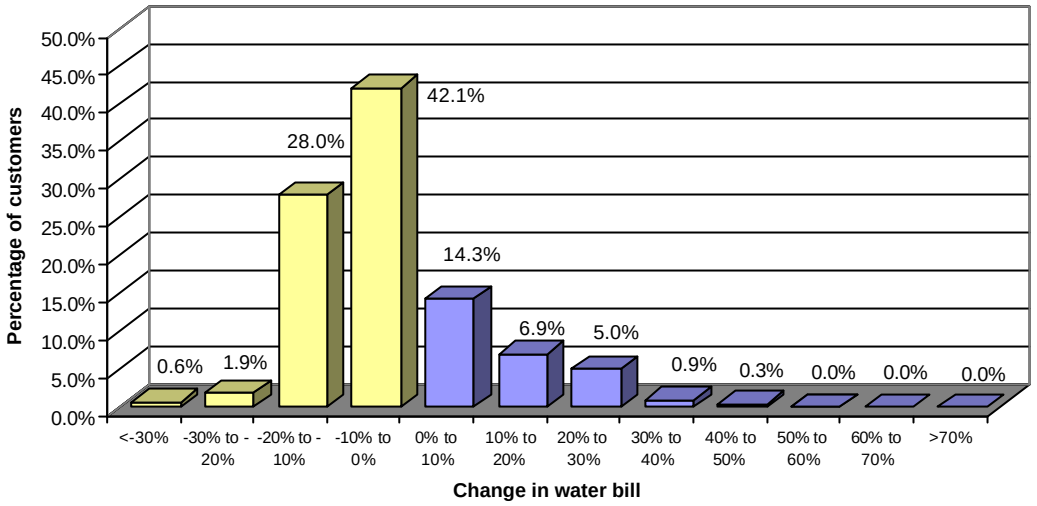
Variable	
- Fixed charge (pa)	$38.28
- Tier 1 price per kL	$1.05
- Tier 2 price per kL	$1.55
- Step quantity (kL)	300
Residential demand savings (pa)	
- Change in residential water cons (GL) using average price	-6.45
- Change in residential water cons (GL) using marginal price	-24.83

A relatively low step point combined with a higher Tier 1 water usage charge ensures that a large proportion of customers would experience an increase in their marginal water price. If decisions about water consumption are based upon the marginal price, an increase in the water usage charge for all customers (as shown above) substantially increases the potential demand response. Under Scenario 8, the Tribunal's preliminary modelling indicates that residential customers would reduce consumption by approximately 6.45GL per annum, assuming they respond to changes in average price and approximately 24.83GL per annum if they respond to changes in the marginal price.

A2.5.2 Residential customer impact

Analysis of potential customer impacts is presented in Figure A2.5 below.

Figure A2.5 Residential customer impact analysis – Inclining-block tariff - Scenario 8



A2.6 Scenario 9 – Inclining-block tariff

A2.6.1 Scenario variables

Scenario 9 consists of a reduction in the fixed access charge to half of its current level and an increase in the Tier 1 water usage price from $0.98 per kL to $1.05 per kL for consumption below 400kL per annum. For consumption in excess of 400kL per annum the Tier 2 water usage price would increase to $2.00 per kL.

Table A2.6 Scenario 9

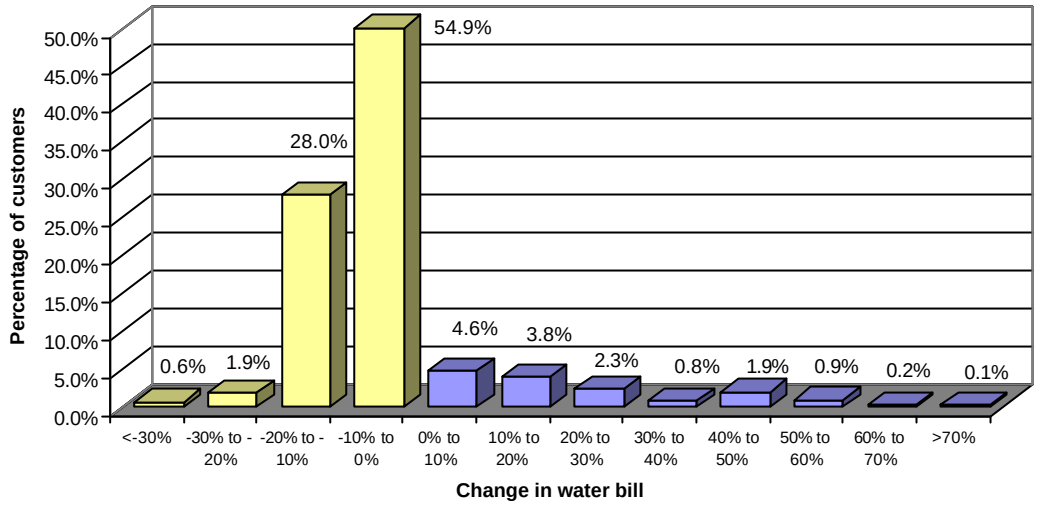
Variable	
- Fixed charge (pa)	$38.28
- Tier 1 price per kL	$1.05
- Tier 2 price per kL	$2.00
- Step quantity (kL)	400
Residential demand savings (pa)	
- Change in residential water cons (GL) using average price	-6.75
- Change in residential water cons (GL) using marginal price	-23.59

As was the case in Scenario 8, a higher water usage charge for all customers ensures that a large proportion of customers would experience an increase in their marginal water price. Where decisions about water consumption are based upon the marginal price, an increase in the water usage charge for all customers (as shown above) substantially increases the potential demand response. Under Scenario 8, the Tribunal's preliminary modelling indicates that residential customers would reduce consumption by approximately 6.75GL per annum, assuming they respond to changes in average price and approximately 23.59GL per annum if they respond to changes in the marginal price.

A2.6.2 Residential customer impact

Analysis of potential customer impacts is presented in Figure A2.6 below.

Figure A2.6 Residential customer impact analysis – Inclining-block tariff - Scenario 9



APPENDIX 3 REFERENCE LIST

AATSE and IE AUSTRALIA, 1999. *Water and the Australian Economy.* Australian Academy of Technological Sciences and Engineering and the Institution of Engineers, Australia, pp 52-53.

BILLINGS, R.B and DAY, W.M. 1989. *Demand management factors in residential water use: The Southern Arizona Experience.* Journal of the American Water Works Association, vol. 81, No. 3, pp 58-64.

CHICOINE, D.L, DELLER, S.C and RAMAMURTHY, G. 1986. *Water Demand Estimation Under Block Rate Pricing: A Simultaneous Equation Approach.* Water Resources Research, Vol. 22, No. 6, pp 859-863.

DALHUISEN, J.M, FLORAX, R.J.G.M, DE GROOT, H.L.F, and NIJKAMP, P. 2000. *Price and Income Elasticities of Residential Water Demand: Why empirical estimates differ.* Vrije Universiteit and Tinbergen Institute Amsterdam.

GRACIA, F.A, GRACIA–VALINAS, M.A and MARTINEZ-ESPINEIRA, R. 2001. *The Literature on the Estimation of Residential Water Demand.* Elsevier Science Ltd.

METROPOLITAN WATER AUTHORITY, 1985. *Domestic water use in Perth, Western Australia*. Metropolitan Water Centre, Leederville.

NIESWIADOMY, M. 1992. *Estimating Urban Residential Water Demand: The Effects of Price Structure, Conservation, and Education.* Water Resources Research, Vol. 28, No. 3, pp 609-615.

STEVENS, T.H, MILLER, J and WILLIS, C. 1993. *Effect of Pricing Structure on Residential Water Demand. Water Resources Bulletin.* Vol. 28, No. 4, pp 681-685.

THOMAS, J, SYME, G and GOSSELINK, Y. 1983. *Household responses to changes in the price of water in Perth, Western Australia.* Paper delivered at the Hobart Hydrology and Water Resources Symposium, November.

WARNER, R. 1996. *Water Pricing and the Marginal Cost of Water.* Sydney Water Corporation.