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Form of Price Control: SunWater Water Supply Schemes

Issues Paper prepared for the Queensland Competition Authority

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1. Introduction

NERA Economic Consulting (NERA) has been asked by the Queensland Competition Authority (the Authority) to identify the key issues relevant to establishing the most appropriate form of price control to apply to SunWater's rural irrigation customers. The existing irrigation price path commenced on 1 July 2006 and is due to expire on 30 June 2011 (2006-11). The Premier and the Treasurer (the Ministers) have directed the Authority to recommend irrigation prices for the next period, from 1 July 2011 to 30 June 2016.

In recommending the next price path, the Authority will need to determine the appropriate form of price control. This will require a decision between the use of price or revenue caps as the mechanism for giving effect to a multi-year determination of maximum prices. This report examines the issues to be charged for services subject to price control associated with that decision, which is separate from the question of the expected costs and allowed total revenues which will be considered separately by the Authority.

Irrigators each belong to a Water Supply Scheme (WSS) with divergent characteristics across each, such as the type of service provided, water availability and cost structure. Whilst we recognise that these variances may result in differing applicability, the matters raised in this report are addressed of a sufficiently high level in order to identify the relevant issues across all of SunWater's irrigation customers.

The remainder of this report is structured as follows:

- Section 2 discusses the objective of economic regulation and implications for considering the form of price control;
- Section 3 describes the background and context for this issues paper, including the current regulatory arrangements of SunWater;
- Section 4 discusses the available forms of price control;
- Section 5 assesses the stated forms of price control with respect to SunWater's business and customers utilising proposed economic and regulatory criteria;
- Section 6 presents case studies regarding the regulation of rural water schemes in Australia; and
- Section 7 summarises the pertinent criteria for the Authority in selecting the most appropriate form of price control.

2. Objective of Economic Regulation

This section explains the objective of economic regulation, the benefits that may be derived and the means of obtaining the stated objective.

2.1. Economic Efficiency

Traditionally, regulation is imposed on infrastructure businesses with a high degree of market power to protect society from the loss that arises from the exercise of that power, usually in the form of higher prices and lower output than would otherwise be the case. This typically arises in industries characterised by the existence of highly specific investment needs (which gives rise to sunk costs) and increasing returns to scale (natural monopolies). These conditions generally mean that it is more efficient for there to be just one or a small number of suppliers in the market.

Firms with a substantial degree of market power are largely insulated from the constraints imposed by competition, either by actual rivals or the fear of new entry. Without that pressure, the firm has the ability to raise prices above the competitive level. By increasing prices above the long run cost of providing the service, some consumers that would otherwise have been willing/able to consume the good or service do not. Such firms are often also in a position to undertake production decisions that are not closely focused on customer demands, such as limiting services to particular customers or geographic areas or limiting the total quantity produced. Both of these situations (higher prices and lower output) result in unmet consumer demand, even though the cost of serving that demand could be less than its value to consumers.

However, many of SunWater's WSS prices are *lower* than its costs. This is principally because its history of government ownership has acted as *de facto* regulation by constraining prices, although broader policy objectives have also contributed to disconnecting prices from underlying costs. Some of the costs incurred in providing services have effectively been met by taxpayer funds that could otherwise have been utilised to provide other government programs or services. Further, since the price signal to users is not reflective of the cost of its provision, this may have brought about or could lead to over-consumption.

This highlights the central purpose of economic regulation, which is to establish arrangements that help to ensure *economically efficient* outcomes. Economic efficiency has three dimensions:

- *allocative efficiency* – this requires that resources are allocated to their most productive or highly-valued uses in the economy. Importantly the structure of prices needs to ensure that revenues are adequate to support efficient investment (a dynamic dimension) while also ensuing that production is expanded to levels where prices reflect marginal costs;
- *productive efficiency* – this requires the production of goods and services at lowest possible cost. Production, administration and regulatory costs need to be minimised for a given task or objective for productive efficiency to be achieved; and
- *dynamic efficiency* – this requires the efficient allocation and production of goods and services over time. This means making optimal decisions with respect to the nature and timing of investment in the pursuit of better products and better ways of producing goods and services. Revenues need to be sufficient to cover the cost of forward looking investment in order to support the pursuit of productivity improvements or efficient output expansion.

These concepts underline the challenges of economic regulation, which is to balance the competing objectives of providing a reasonable prospect of revenue recovery while also encouraging improvements in productivity. The various aspects of economic efficiency are therefore important criteria for applying regulation to entities with market power as well as in developing governance arrangements for government owned enterprises.

2.2. The Objective of Economic Efficiency in the Water Sector

There has been significant reform in the Australian water sector in order to improve economic efficiency. This commenced in 1994 with pricing principles agreed by the Council of Australian Governments (COAG). In 2004 COAG signed the National Water Initiative (NWI), which provides a blueprint for water reform, particularly to achieve a more cohesive national approach to the way water is managed, measured, planned, priced and traded. The NWI requires independent regulators to publicly set or review prices or price setting processes for both government and privately owned water businesses. Additionally, prices are to:[1]

- promote economically efficient and sustainable use of water resources, water infrastructure assets and government resources devoted to the management of water;
- ensure sufficient revenue streams to allow efficient delivery of the required services;
- facilitate the efficient functioning of water markets in both rural and urban settings;
- give effect to the principle of 'user-pays' and achieve pricing transparency in respect of water storage and delivery in irrigation systems and cost recovery for water planning and management;
- avoid perverse or unintended pricing outcomes; and
- provide appropriate mechanism for the release of unallocated water.

These principles (best practice water pricing) are consistent with the widely accepted objectives of economic regulation as well as the requirements for the Authority under the

[1] NWI, s64.

Queensland Competition Authority Act 1997. When the Authority conducts investigations it has an extensive list of considerations grouped primarily around, in its own words, efficiency, sustainability, affordability and other public interest matters.[2] In its recent draft decision on the prices of the Gladstone Area Water Board, the Authority also stated that:[3]

> *in broad terms, the QCA Act requires the Authority to ensure that: (i) service providers do not take advantage of their monopoly position; (ii) pricing practices must be consistent with the regulatory objectives of economic efficiency and revenue adequacy; and (iii) pricing practices must take account of the public interest. Further, the Authority consider[s] that a properly functioning competitive market is the appropriate benchmark for establishing efficient outcomes.*

Indeed, in relation to the Authority's development of irrigation tariffs it has been specifically asked to provide a revenue stream that allows SunWater to recover:[4]

> *a) its efficient operational, maintenance and administrative costs;*
>
> *b) its expenditure on renewing and rehabilitating existing assets, whether through a renewals annuity or a regulatory depreciation allowance;*
>
> *c) a rate of return on assets valued at 1 July 2011, as specified in 1.4 (below) (the initial regulated asset base (RAB)); and*
>
> *d) after 1 July 2011, a return of, and on, prudent capital expenditure on existing assets or for constructing new assets.*

In SunWater's case the Authority has a role in assisting the irrigation sector to achieve greater economic efficiency through the implementation of efficient pricing and complementary arrangements to provide appropriate incentives to pursue the various aspects of economic efficiency.

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2 QCA, Final Report, SEQ Interim Price Monitoring Framework, April 2010, pp13-14.

3 QCA, Draft Report, Gladstone Area Water Board: Investigation of Pricing Practices, March 2010, pg6.

4 Queensland Government Gazette No.74, Ministers' Referral Notice, 19 March 2010.

3. Background and Context

The price investigation currently underway for 2011-16 is the first review for which the Authority will be recommending prices for SunWater's irrigation schemes. It is therefore important to examine the nature of SunWater's business and existing regulatory arrangements in relation to its irrigation customers in order to identify the key issues for consideration in choosing the appropriate form of price control.

3.1. Overview of SunWater

SunWater is a Queensland government owned corporation that was corporatised in 2000. It provides a number of services to irrigators including:

- *bulk water delivery* - the storage and delivery of water using dams and weirs to a customer in accordance with their entitlements;
- *channel/network services* - the diversion of water to a customer's offtake using pump stations and distribution works; and
- *drainage services* - the acceptance and disposal of water from land serviced by the channel network.

SunWater operates what is known as a 'decentralised' water delivery regime. SunWater owns and maintains the service infrastructure and provides a contracted service to its customers that have water access entitlements (WAEs) through the Department of Environment and Resource Management (DERM). SunWater also holds WAEs to account for distribution losses, general allocations without a specific purpose and reserve allocations that are held for a specific customer or use.[5]

SunWater holds WAEs to account for distribution losses of water for when it is released or diverted for distribution through channel distribution systems. The primary sources of controllable distribution losses include leakage from channels, pumps and/or broken pipes, un-metered or uncontrolled use and 'dumping' of water for maintenance or weed control requirements. Across all schemes there are 362,760ML of WAEs for distribution losses.

This decentralised regime means that water users undertake their own supply management decisions, which includes planning and procurement for any future demand changes.[6] Irrigators' water demand from SunWater is effectively a 'residual' since their primary source of water is through rainfall. Users can manage their water supply risks by holding surplus entitlements with SunWater, sourcing alternative supplies (eg, groundwater) or using temporary trade markets. However, we understand there may be limitations to a customer taking up these options and that the availability of options may vary between schemes. Indeed, entitlement trading is only a relevant option if irrigators face differing weather conditions and the scheme is not over-allocated.

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5 SunWater, *Tier 1 Working Paper No. 11, Treatment of SunWater Allocations, Reserve Allocations and 'Free' Allocations*, 2 March 2006, pg1.

6 SunWater, *Background Paper QCA Review of Irrigation Prices: Service Framework*, May 2010.

Under the decentralised regime, when SunWater undertakes investments to generate additional water entitlements, existing users neither bear the costs of spare capacity nor the risks associated with whether or not that capacity is taken up. Rather, under the current arrangements users who derive a benefit in the form of additional entitlements to water pay for the cost of providing that benefit. Moreover, SunWater does not provide water treatment other than that required to comply with its environmental obligations.

In determining the 2006-11 price path it was identified that where improvements could be made to channels to reduce distribution losses then SunWater could trade the saving. This would provide an incentive for SunWater to identify and reduce sources of distribution loss where the amount earned through trading is greater than the costs incurred in making the improvement. However, we understand that WAES associated with distribution losses are not tradeable so SunWater will need to apply to DERM to have the associated WAEs converted to tradeable permits in order to benefit from the savings.

Bulk water service

SunWater's bulk water service involves storing and delivering raw water to customers in accordance with those customers' entitlement to take it (as prescribed by the customers' WAE). Customer entitlements have two features: the location for taking the water (usually defined by a section of river); and the priority of their water right or allocation (usually defined as high or medium). Water releases are scheduled by SunWater and constrained by storage outlet size and travel times to reach customers' premises. The defined rights contained in WAEs can be altered subject to DERM approval, taking into account any constraints in the Resource Operating Plan (ROP). A customer's diversion of water is also constrained by planning and development laws, which set conditions on pumping works.

The ROP is the overarching regulatory framework for SunWater's bulk water service, which is approved by DERM. The ROP also includes the scope of assets which are utilised to carry out the service in each scheme. Obligations in relation to the ROP are set out in the Resource Operating License (ROL), which is an authority to operate a storage and interfere in the flow of water (storage and release). Key aspects of the ROL and related conditions set out in the associated ROP include:[7]

- operational conditions for storages, such as minimum storage levels, environmental release rules and constraints on changes in the rates of release;
- water sharing rules (such as announced allocation or continuous sharing rules);
- environmental monitoring and reporting requirements; and
- recording and reporting water use by entitlement holders.

SunWater is only able to provide bulk water services to holders of WAEs and so WAE holders must also hold a contract with SunWater, the asset owner. Since SunWater operates a decentralised system, it is not required to provide a defined level of service through supply planning and augmentations. During droughts or water shortages SunWater continues to be

[7] SunWater, *Background Paper QCA Review of Irrigation Prices: Service Framework*, May 2010, pg5.

responsible to deliver water to entitlement holders, in accordance with the water sharing rules as well as Critical Water Sharing Arrangements, which are both approved by DERM.

Most schemes operate under an announced allocation regime whereby the water sharing rules specify the restrictions imposed on water users when there is not enough water to fully supply all users. The Announced Allocation can vary between 0% and 100% and describes the percentage of the WAE that is available to customers. These rules apply within one year.

Channel service

Channel or network services comprise a separate, additional contracted service to the bulk water delivery. For this service, SunWater is obliged to divert the water available to the customer and deliver it to its offtake from SunWater's pump stations or river offtakes, which are sometimes also used to provide the bulk water service.

Water is supplied at different times of the year depending on availability, as opposed to a specified season, which is the case in New South Wales and Victoria. Water availability can also vary significantly between schemes and is any case determined after the announced allocation system has accounted for minimum operating levels, evaporation and transmission loss provision, high priority reserves for current and future years and any carryover provisions that may exist. Deliveries are subject to ordering times, which are constrained by the nature of the infrastructure. In some cases orders can be provided 'on demand' whereas others require advance notice. When demand exceeds supply or the capacity of the system, water is rationed in accordance with an established regime of flow rate limitations and/or a roster.[8]

Most schemes operate under an announced allocation regime whereby the water sharing rules specify the restrictions imposed on water users when there is not enough water to fully supply all users. The Announced Allocation can vary between 0% and 100% and describes the percentage of the WAE that is available to customers.

Drainage service

The drainage service is the acceptance and disposal of water from land, which is usually also serviced by the channel network. Drainage infrastructure is designed to remove large rainfall events, although it can also accept excess water from irrigation. Since the drainage assets were developed with the channel network these services are provided in the same area.[9]

The figure below illustrates the relationship between SunWater, its customers and DERM.

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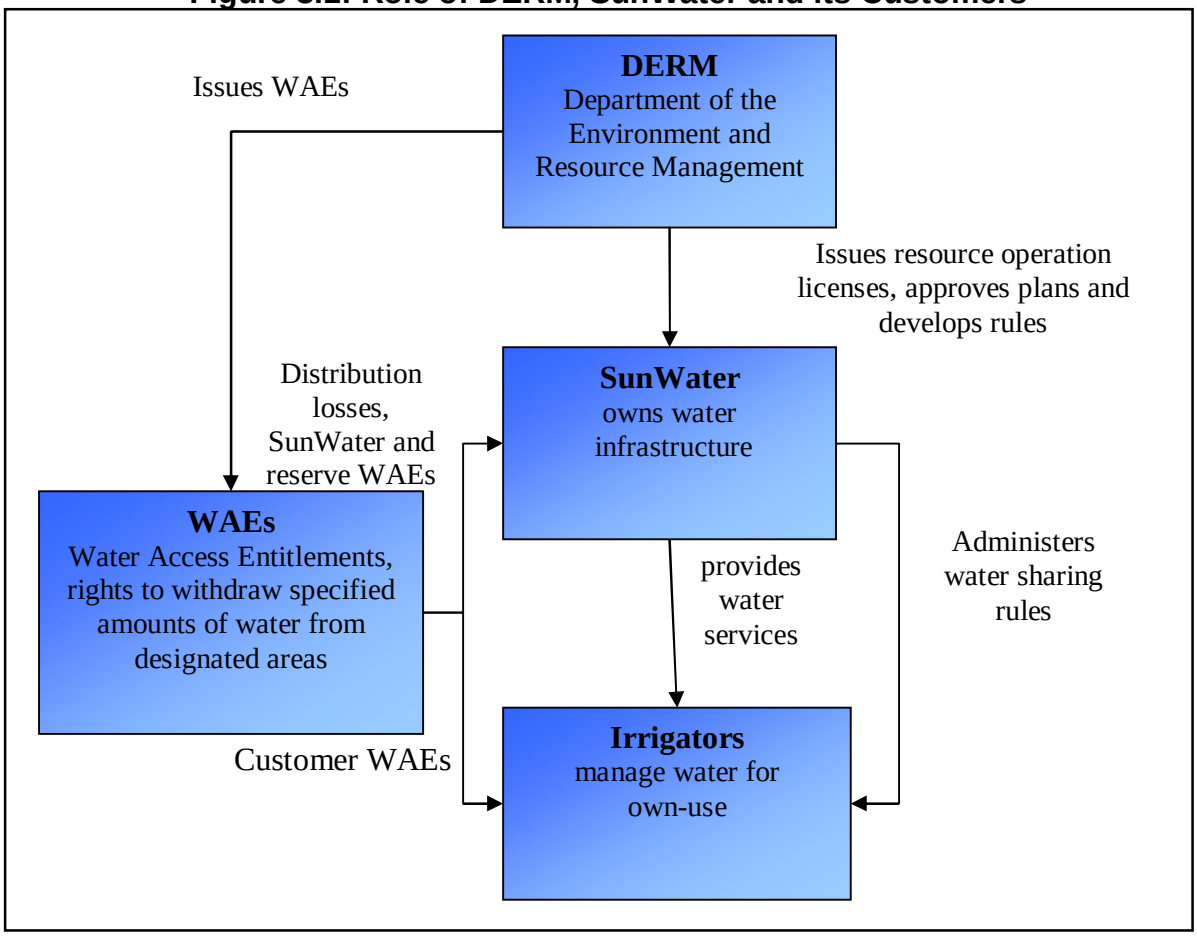
[8] SunWater, *Background Paper QCA Review of Irrigation Prices: Service Framework*, May 2010, pp6-7.

[9] SunWater, *Background Paper QCA Review of Irrigation Prices: Service Framework*, May 2010, pg7.

Figure 3.1: Role of DERM, SunWater and its Customers



These arrangements contrast with those of centralised regimes, which operate primarily in urban areas. In such circumstances the service provider is responsible for the supply-demand balance and plans accordingly. As such, the costs of augmentations to provide for future capacity are borne by all customers.

3.2. Current Irrigation Price Path[10]

Current irrigation prices and conditions were negotiated between SunWater and irrigators, subject to government policy requirements. These requirements included that 'lower bound' pricing be achieved by most WSSs by the end of the price path. 'Lower bound' represents the amount a water business should recover to be viable. In the circumstances of the 2006-11 period, lower bound pricing requires the recovery of operating, maintenance, administration and asset refurbishment costs.[11] The nationally agreed definition of lower bound costs also includes interest cost on debt, externalities, taxes and dividends (if any).[12]

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[10] SunWater, *Statewide Irrigation Pricing Working Group, Tier 1 Report*, April 2006; and SunWater, *SunWater Irrigation Price Paths 2006/07 – 2010/11: Final Report*, September 2006.

[11] SunWater, *Statewide Irrigation Pricing Working Group, Tier 1 Report*, April 2006, pg8.

[12] Intergovernmental Agreement on a National Water Initiative, pg29

The lower bound prices were neither to include capital contributions for specified spillway upgrades nor an additional rate of return. Any WSS with prices above lower bound costs was not permitted price reductions but was required to maintain prices in real terms over the price path.

Schemes or segments within a scheme that cannot achieve lower bound pricing are defined as Category 3 schemes. Accordingly, Community Service Obligation (CSO) payments are made by the government to assist with the transition to lower bound pricing, in combination with capped price increases. CSO payments also provide funding for the full costs of ROP development.

The tariff structure consists of a fixed charge (Part A) which applies to the whole WAE and a volume based variable charge (Part B). The fixed charge is designed to recover costs associated with the cost of providing access to fixed infrastructure and so do not vary with the quantity consumed. The charge is fixed regardless of the amount of water provided since without those assets customers would not be able to receive any water. The variable charge is to recover the incremental costs of providing water, such as the electricity utilised at pumping stations. The ratio of charges between Part A and Part B is generally 70:30. Where schemes had achieved pricing above lower bound costs, any costs above lower bound were to be recovered in the Part B charge thereby introducing revenue risk to only those costs deemed above lower bound.

The current balance between fixed and variable elements of the tariff structure has largely carried over from the previous price path. Two part tariffs have been the most common pricing structure in the Queensland irrigation industry, although the split between fixed and variable has not remained consistent. For a few years prior to 2000 the fixed (Part A) charge was relatively small compared to a large usage (Part B) charge. However, for decades prior to that arrangement tariffs were generally fixed by reference to a proportion of water entitlements, usually around 75%, irrespective of use and included a usage charge only for the water used in excess of the notional quantity included in the fixed component.[13]

We understand that the current tariff structure is materially different from SunWater's cost structure. During the process for establishing the 2006-11 price path, an independent consultant, Indec Consulting, was engaged to review SunWater's costs. According to this study SunWater's fixed costs average 93% of its historical total annual costs[14] whereas the fixed portion of prices averages 64% across schemes.[15] However, this analysis was undertaken across the business as a whole and so does not take into account how the proportion of fixed costs varies between schemes.

Indec Consulting also reviewed the scope for cost savings from efficiency improvements. It identified potential savings with respect to the reviewed year (2003/04) of 7.1% of

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[13] SunWater, *Tier 1 Working Paper No. 13, Tariff Principles & Structures*, 25 August 2005, pg7

[14] SunWater, *SunWater Irrigation Price Paths 2006/07 – 2010/11: Final Report*, September 2006, pg12.

[15] Calculated using SunWater information contained in *SunWater Irrigation Price Paths 2006/07 – 2010/11: Final Report*, September 2006.

controllable costs excluding electricity, insurance, council rates and land tax.[16] These potential cost savings were expressed as a matter of continuous improvement rather than any instantaneously realisable savings given that implementation would require considerable effort over a three-year timeframe. Accordingly, finalised costs for each scheme included a specified productivity adjustment to take into account these potential savings.

The nature of SunWater's rural operation means that water use forecasts are highly unreliable and that actual usage can be extremely variable. For example, in the Upper Condamine Water Supply Scheme, usage rose from 0 ML in 2006/07 to 26,933 ML in 2007/08 out of a total customer allocation of 30,363 ML. Usage can fall below forecast due either to low water availability (due to rationing through the Announced Allocation mechanism) or if the natural rainfall is sufficient and customers do not require irrigation.

Given this demand volatility, SunWater also offered as part of the price path a drought tariff to assist its customers to manage costs in periods of low water availability. During such times, the Part A charge would be reduced and offset by increases in the same charge during periods of high water availability. Any over- or under-recovery would be carried into the following price path. Two schemes adopted the drought tariff, although these tariffs were abandoned when the Queensland Government provided a drought subsidy and agreed to refund Part A charges for irrigators in drought affected schemes.

3.3. Current Forms of Price Control[17]

In negotiating the current prices and conditions, WSSs were given the option of choosing the form of price control, being a price cap or revenue cap. Three of the WSSs opted for a revenue cap arrangement and the remaining schemes chose a price cap. The three schemes under revenue caps are Bowen Broken Rivers, Cunnamulla Weir and Macintyre Brook. It is not explicitly stated in SunWater's reports why these schemes chose a revenue cap, however if the customer believed its actual use would exceed the forecast it would have an incentive to chose a revenue cap.

Under both arrangements individual price caps were set for the five year period based on demand forecasts, with annual adjustments for the change in the Consumer Price Index (CPI). The sections below describe the application of each mechanism and the results thus far in the price path.

Price cap

Since prices are set for the period of the price path, if demand is greater than forecast then SunWater will recover in excess of costs and so will generate a net revenue surplus. Conversely if demand is less than forecast SunWater will have recovered less than its costs and will incur a net revenue deficit. Therefore, any over (or under) recovery of the Part B charge resulting from volume deviations from the forecast will be retained (or financed) by

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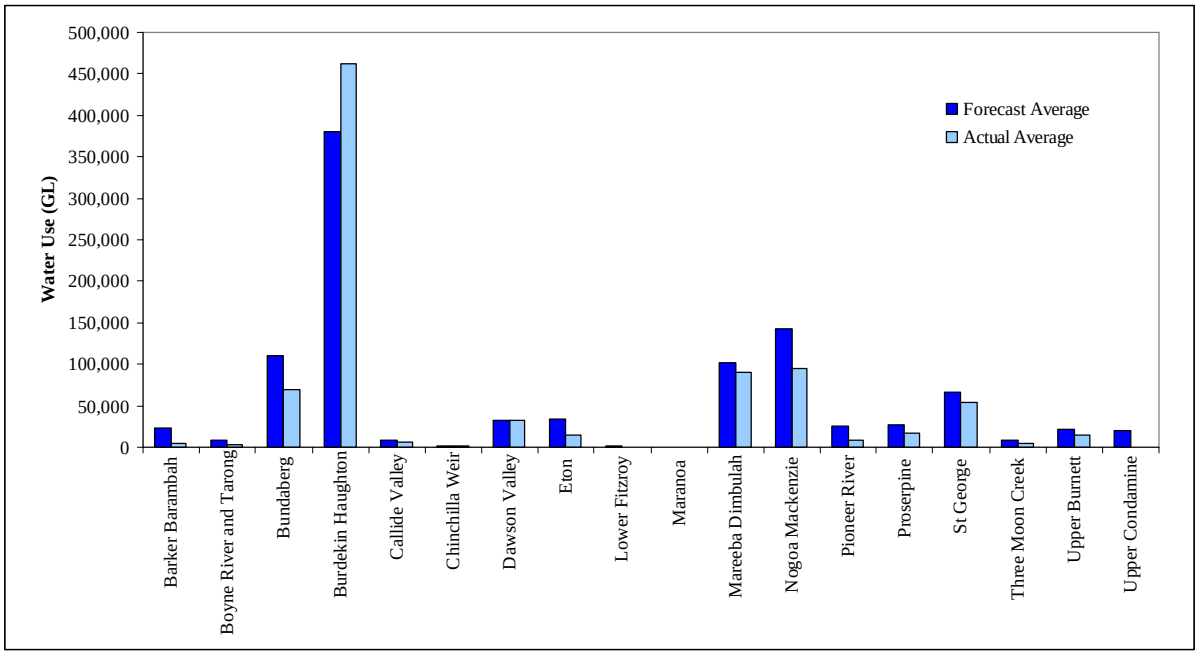
[16] SunWater, *SunWater Irrigation Price Paths 2006/07 – 2010/11: Final Report*, September 2006, Appendix 9.3: Indec Cost and Efficiency Review, Management Summary.

[17] SunWater, *Statewide Irrigation Pricing Working Group, Tier 1 Report*, April 2006; and SunWater, *SunWater Irrigation Price Paths 2006/07 – 2010/11: Final Report*, September 2006.

SunWater. There is no mechanism to return (or recover) an over- (or under-) recovery of revenues.

Out of the schemes with price caps, four have actual water use greater than their forecasts for at least one of the three years for which data is available. Generally, since the commencement of the current price path in 2006, SunWater is experiencing water sales significantly below forecast, which will likely lead to a revenue shortfall that exceeds the savings in costs that arise from supplying lower volumes of water. For the schemes under a price cap, this shortfall in revenue (and revenue net of variable costs) will not be offset in the next regulatory period. This highlights the revenue risks to which SunWater is subject under price cap arrangements. The deviations in actual water use compared to the forecast, as well as the variation in water use between schemes, is illustrated in the figure below.

Figure 3.2: Average Water Use by Scheme (2006/07 – 2008/09)



Source: QCA

Revenue cap

Under the current SunWater revenue cap, prices have been set for the five years of the price path based on demand forecasts. Any cumulative over or under revenue balance due to a variance between forecast and actual demand is carried over into the next control period. This means that price changes due to actual demand being different from that forecast for the regulatory period do not take effect until the start of the next price path. In effect, the revenue cap currently in place in some schemes has the same within-period effects in terms of prices as a price cap, while adjustment for actual demand is made at the commencement of the next price path to compensate either SunWater or the customer for cost differences due to actual demand.

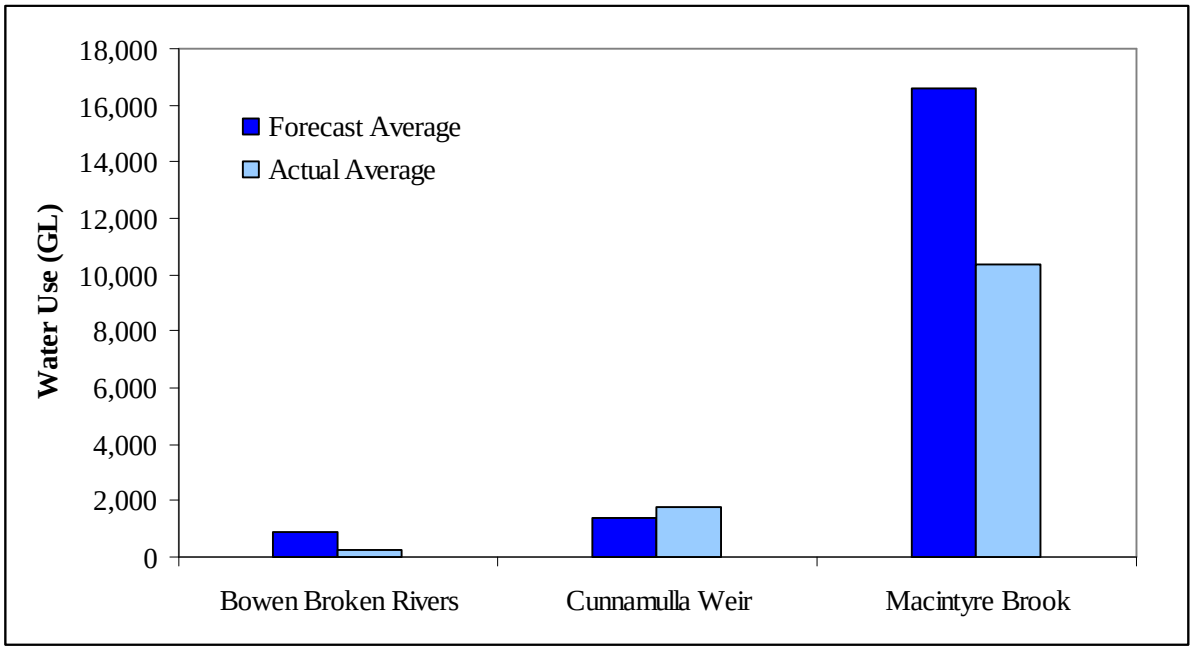
Any positive or negative balance arising under the revenue cap option is applied to the Part A charge for the next price path. This means that if volumes sold are lower than forecast (such that revenue recovery from Part B is lower than forecast) the Part A tariffs will be increased

in the next regulatory period to make up the difference. The converse applies if volumes are higher than forecast, with the overall effect being to ensure the specified revenue target is exactly met over time.

Under the revenue cap a finance charge is also applicable whereby any under-recovery is effectively charged interest by SunWater and over-recovery requires SunWater to pay interest. The finance charge is also applicable to the drought tariff. The finance charge is to account for the costs (or benefits) to SunWater for under- (or over-) recovery of revenues arising out of actual demand differing from the forecast or for the increases and decreases in the fixed charge for the drought tariff.

Of the three schemes that opted for a revenue cap arrangement, so far in the period one is experiencing actual water use greater than the forecast, and the other two are below the forecast. If this trend continues then the scheme currently experiencing actual water use greater than forecast will have a decrease in the Part A charge. The other two will experience an increase in the Part A charge at the commencement of the next price path to ensure that the total revenue requirement is met over time.[18] Average actual water use compared to the forecast for the period between 2006/07 and 2008/09 is illustrated in the figure below.

Figure 3.3: Average Water Use by Scheme (2006/07 – 2008/09)



Source: QCA

[18] The future adjustment to the Part A charge described assumes that the agreement reached with these three schemes is continued without alteration. The Authority is yet to make a decision on the form of price control and the carry over mechanism.

4. Forms of Price Control

The form of price control specifies the manner by which a regulated entity can recover its costs. The choice of price control is primarily that between price and revenue caps, with hybrid approaches essentially representing a combination of the two.

When demand cannot be exactly predicted and when the tariff structure does not perfectly align with the cost structure, a revenue cap is more effective than a price cap in terms of providing a specified level of revenue. However, a pure total revenue cap operates as both a ceiling and a guarantee of revenue. It eliminates volume risk for a regulated monopoly, provided it still has a customer base to pay higher prices if volumes decline and provided there are no constraints on the firm increasing prices. More generally, in comparison with a price cap, a pure revenue cap reduces the pressure to operate efficiently and/or to pursue increased sales that may otherwise be efficient to make. Revenue caps may also bring about a high degree of variability in consumer prices.

If a firm's tariff structure was perfectly aligned with its cost structure, then under a price cap a change in demand would be perfectly offset by its change in costs. Likewise, if demand could be accurately predicted then the regulated entity could always recover its costs with precision, under either a revenue cap or a price cap, provided cost recovery was facilitated by the regulatory arrangements. In the absence of either of these conditions being met it is necessary to consider the form of price control as one means of providing greater certainty for a firm's revenues (net of variable costs). However, addressing revenue adequacy is only one aspect of economic efficiency and the choice of the form of price control needs to also have regard to incentives to pursue other aspects of economic efficiency such as productivity improvements and efficient expansion.

In this respect, an important consideration for the form of price control is the adequacy of the incentives it provides for an operator to produce an economically efficient quantity at least cost. In the case of SunWater, there should be an appropriate incentive to save water and minimise distribution losses. The form of price control should encourage SunWater to make water efficiency savings by allowing it to benefit from the savings made. These issues are discussed in more detail in the remainder of this section.

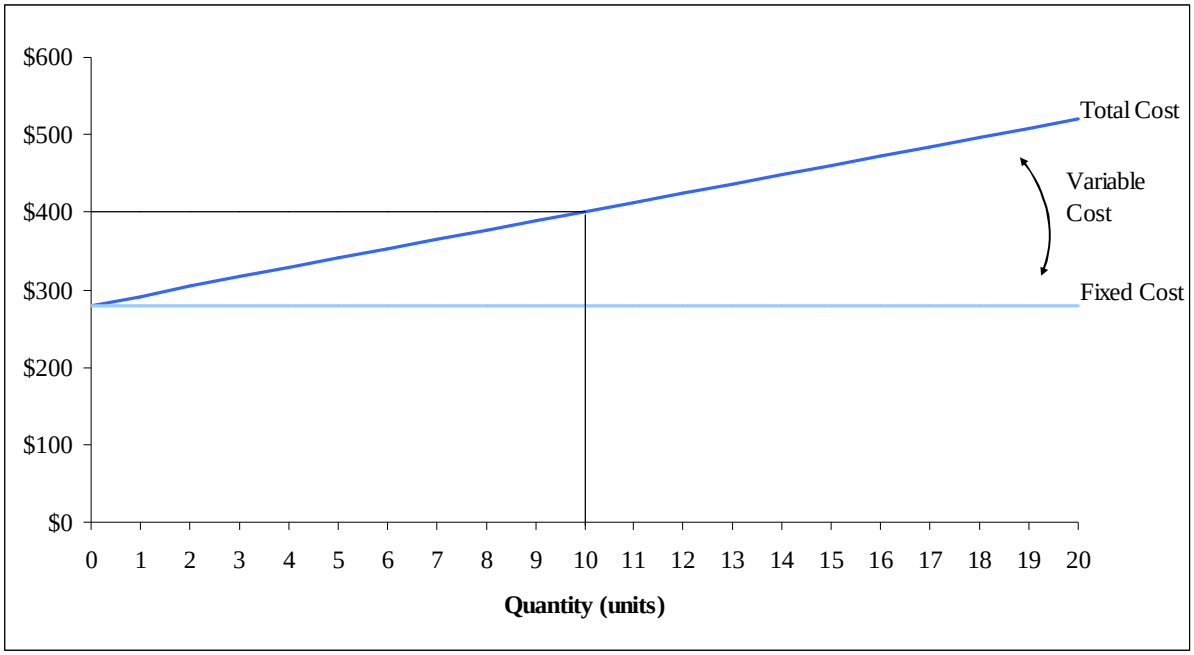
Price and revenue caps can be implemented in myriad ways, and so our analysis is presented in a stylised, 'in principle' form in order to highlight their fundamental characteristics and the alternative ways in which a price cap or a revenue cap can be modified to address various drawbacks. In addition, we discuss how incentive mechanisms can be built into either approach to encourage productivity improvements.

4.1. Price and Revenue Caps

The basic approach to establishing a regulated price path involves developing forecasts of demand for services and the costs of meeting that demand no matter the form of price control. The revenue requirement is the annual amount that is approved by the regulator to be recovered through charges to customers for the regulated service. The critical distinction between price and revenue caps is best illustrated by reference to a numerical example.

Consider a firm that has fixed costs of $280, variable (marginal) costs of $12 per unit of output and has forecast that it will sell 10 units of output. The forecast total cost for 10 units is therefore $400. This is illustrated in the figure below.

Figure 4.1: Example Firm Cost Structure



This fictional firm example is utilised throughout the remainder of this section to illustrate the operation of revenue and price caps.

4.1.1. Revenue cap

Under a revenue cap the permissible annual revenue is fixed so as to be equal to the annual revenue requirement for a given forecast demand. Alternatively, the revenue can be fixed per unit of output, and is referred to as an average revenue cap or revenue yield. Regardless of how it is applied, the critical distinguishing feature of a revenue cap is that the regulated firm's revenue is recovered from customers through a full adjustment of prices, irrespective of the extent to which the demand forecast on which the revenue cap was based turns out to be correct.

This adjustment of prices can occur within the regulatory period or at the commencement of the next period by taking into account any over- or under-recovery of revenue in calculating the next period's price path. Currently, the revenue cap adopted by some of SunWater's customers includes an adjustment at the commencement of the next price path (regulatory period) to account for any over- or under-recovery as a result of any demand deviations from the forecast during the current period.

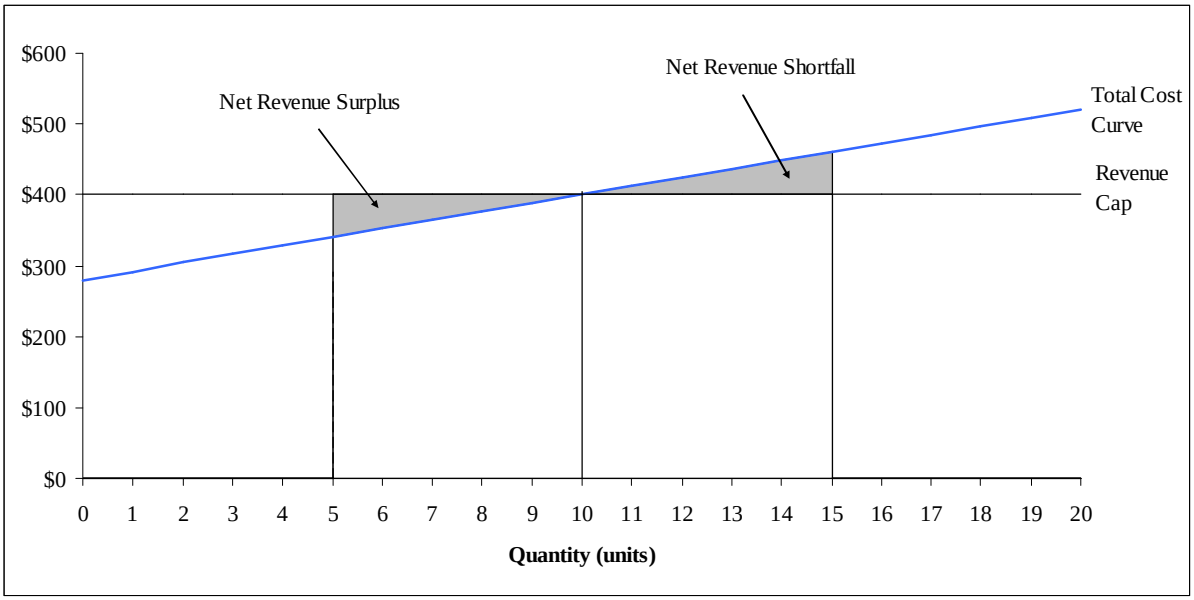
In applying the numerical example above, we consider two separate scenarios to demonstrate the impact of a revenue cap. In the first scenario, the revenue is collected only through a fixed charge. In the SunWater context, this equates to a 100% Part A charge. In the second scenario, the revenue is collected through a two part tariff with a small fixed component.

Revenue cap with fixed prices

For this scenario, the revenue is collected only through a fixed charge. The revenue cap is calculated to be $400 (based on the forecast sale of 10 allocation units), with a $40 fixed charge for each allocated unit of output, which is similar to SunWater's Part A charge that is fixed. If actual demand is less than forecast (say, 5 units) then the firm's revenue will remain the same but costs will have reduced (by $60, being 5 units with an average variable cost of $12). In that event the firm will have surplus 'net revenues', ie, the difference between revenue and total costs. By contrast, if actual demand is greater than forecast (say, 15 units) then the firm's revenue will also remain the same, but costs will have increased (by $60). In that event, the firm will have a shortfall in 'net revenues', also of $60.

The relationship between output, total costs, capped revenue and so net revenues is depicted in Figure 4.2.

Figure 4.2: Revenue Cap with Fixed Prices



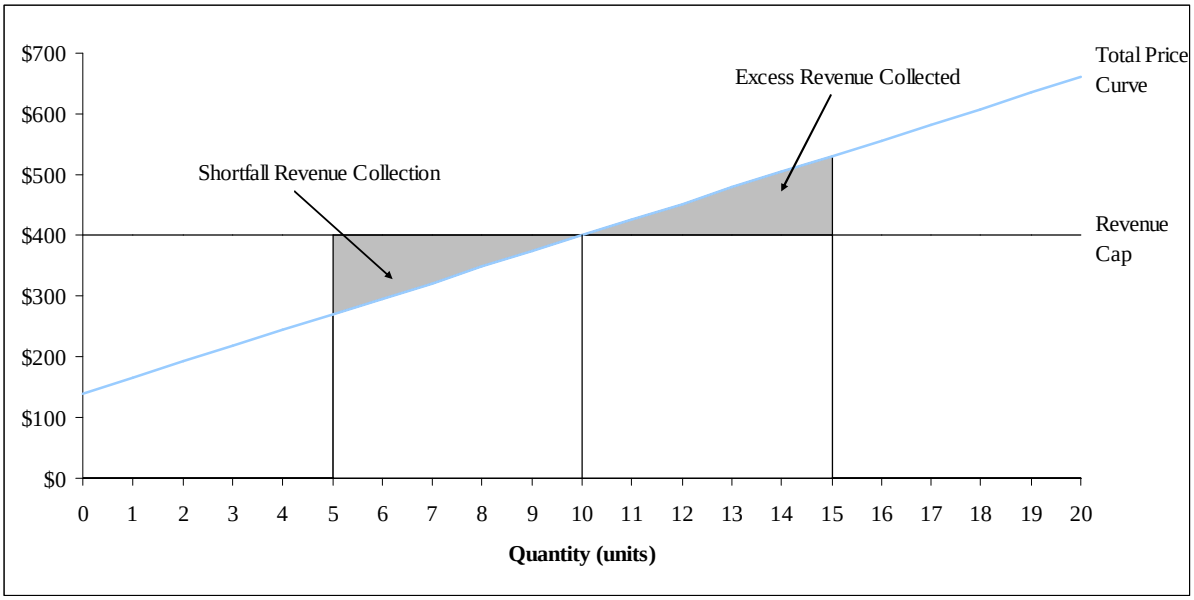
Since in this case there is a fixed charge equal to the revenue cap, no adjustment would be required to prices in this or the next period. However, the example illustrates that there will be a difference between the revenue cap and net revenues received when actual demand is different from the forecast, given that there are some costs that vary with output.

Revenue cap with fixed and variable prices

In the second scenario, it is assumed that the firm has a price structure that recovers half of its fixed costs through a fixed charge and the remainder through a variable charge. The fixed charge is $14 and the variable charge is $26. The firm will collect $140 through the fixed charge and, if there are 10 units sold, the firm will collect $260 through the variable charge. The variable component of the price is greater than the marginal variable cost component which is $12. This is generally representative of the situation for SunWater for its 2006-11 price path in that variable charges are higher than the variable components of costs. With demand lower than forecast the firm will not collect the entire revenue allowance and with

demand higher the firm will over collect revenue compared to the allowance. This scenario is illustrated in Figure 4.3 below.

Figure 4.3: Revenue Cap with Fixed and Variable Prices



The graph shows that if demand deviates from the forecast the firm will collect revenues different from the revenue cap. Accordingly, prices will need to adjust in order to ensure that the cap is met. After adjustment, the differences between actual demand and forecast demand will result in the firm experiencing either a net revenue surplus or deficit as illustrated in Figure 4.2 in the section above.

There are two main options available for adjusting prices to ensure the revenue cap is met. These are the creation of an unders and over account or allowing the operator to adjust prices within the period.

Unders and overs account

In the case when outturn revenue differs from the amount of the cap because outturn demand is different from forecast, then an unders and over account can be established to keep track of the cumulative under or over recovery. Prices can be subsequently adjusted to ensure that the full revenue requirement is collected over time, regardless of variations in demand.

Assuming demand is relatively unresponsive to price, when outturn demand is below forecast prices will need to increase and when demand is above the forecast prices will need to decrease. These adjustments can be made on an ongoing basis or at defined intervals throughout the regulatory period or a cumulative amount can be taken into account for the next regulatory period (which is the current approach). A critical difference between adjusting prices within the period compared to at the end is the potential for a different price to affect actual demand, which depends on its elasticity. The elasticity of demand is a measure of how sensitive demand is to changes in price.

In considering the appropriate adjustment, there are two options. The adjustment could be the difference between:

- the total price curve and the total cost curve; or
- the total price curve and the revenue cap.

Under the first option, the net revenue surplus (shortfall) identified in figure 4.3 is returned to (recovered from) customers. The firm's revenue will exactly equal its costs over the long term (assuming there are interest adjustments relating to holding periods for unders and overs). This outcome provides perfect revenue adequacy for the operator but may reduce the incentive for the firm to seek to reduce its costs since all its costs are recovered, over time. To address this, the regulator could allow for the firm to retain any cost reductions by calculating the adjustment by using the cost curve determined at the commencement of the regulatory period.

Under the second approach, the firm will exactly recover the revenue cap over time and there will be a net revenue surplus or deficit as identified in figure 4.2. However, as the cost curve is relatively flat (as currently 93% of costs are fixed) the difference between the two approaches is substantially reduced.

Within regulatory period price adjustment

If a firm was able to adjust its prices within a year then, under certain conditions,[19] the firm would be able to recover its full revenue requirement in each year.

In practice, water demand in any year may fall well below the central case forecast and, in these circumstances, the variable component of prices may need to rise significantly within the regulatory period for SunWater to recover its total revenue requirement. However, higher variable prices may in turn reduce demand and SunWater may not realise a net revenue surplus, depending on the price and quantity and cost combination that arises.

Since usage is typically not uniform through the year, there are likely to be practical difficulties for SunWater in determining whether usage is on track to meet the forecast and to adjust prices to reflect that outcome.

In principle, a revenue cap could provide for intra-year price adjustments, allowing SunWater to seek to recover its full revenue requirement in any given year. Given the uncertainty in estimating usage, SunWater would most likely have an incentive to charge a high price at the beginning of the year to increase the likelihood that the revenue requirement is fully recovered even if usage is less than forecast.

Towards the end of the year, if SunWater were on track to over recover its revenue requirement it would most likely have an incentive to reduce the amount of revenue it collects. Depending on the responsiveness of demand to prices, this can be done either by increasing the price for water to discourage irrigators from purchasing it or reducing the price such that very little revenue is recovered through the sale of additional water.

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[19] These circumstances include irrigation water demonstrating inelastic properties so that price can be increased with the consequence that demand will decrease by a materially smaller percentage than the increase in price.

Given these options, SunWater may prefer to increase prices so that the water can remain unsold in order to allow it to be sold in subsequent years and also to ensure that additional variable costs are not incurred. However, these results are only likely to occur if it is the variable charge that is adjusted in response to demand changes and if demand is sufficiently responsive to prices.

Should the fixed charge adjust, it is unlikely to affect behaviour (since the fixed charge is unrelated to the amount consumed). Presumably though, if fixed charges could be adjusted so as to bring them into closer alignment with costs, there would be little or no need for a revenue cap. Consequently, a revenue cap that limited the changes in variable prices would provide more price stability for customers whilst still enabling revenue certainty to SunWater. Options to address demand and price variability will be discussed in the following sections.

4.2.2 Price caps

Under a price cap, the maximum prices that can be charged are fixed, either by individual tariff parameters or by reference to a weighted basket of tariff parameters. If the structure of tariffs is set in a way that does not reflect the structure of costs – say, because the variable component of tariffs is set at a level higher than the variable component of costs – then a price cap also gives rise to a risk that a firm's actual revenues will depart from its actual total costs. If the variable component of tariffs is greater than the variable component of costs then actual demand greater than forecast will give rise to a net revenue surplus. Conversely, actual demand below forecast will cause a net revenue deficit. However, an important consequence of these risks is that, under a price cap, the firm has an incentive to reduce its net revenue risks by bringing its tariff structure into line with it cost structure.

The scenario from above where the firm has a tariff structure that provides half of its revenue from a fixed price and the other half from a variable price is illustrated in Figure 4.4 below. Because the variable price is higher than variable cost, the figure also shows that where deviations in demand occur there will be differences in net revenue.

Figure 4.4: Price Cap with Misaligned Tariffs

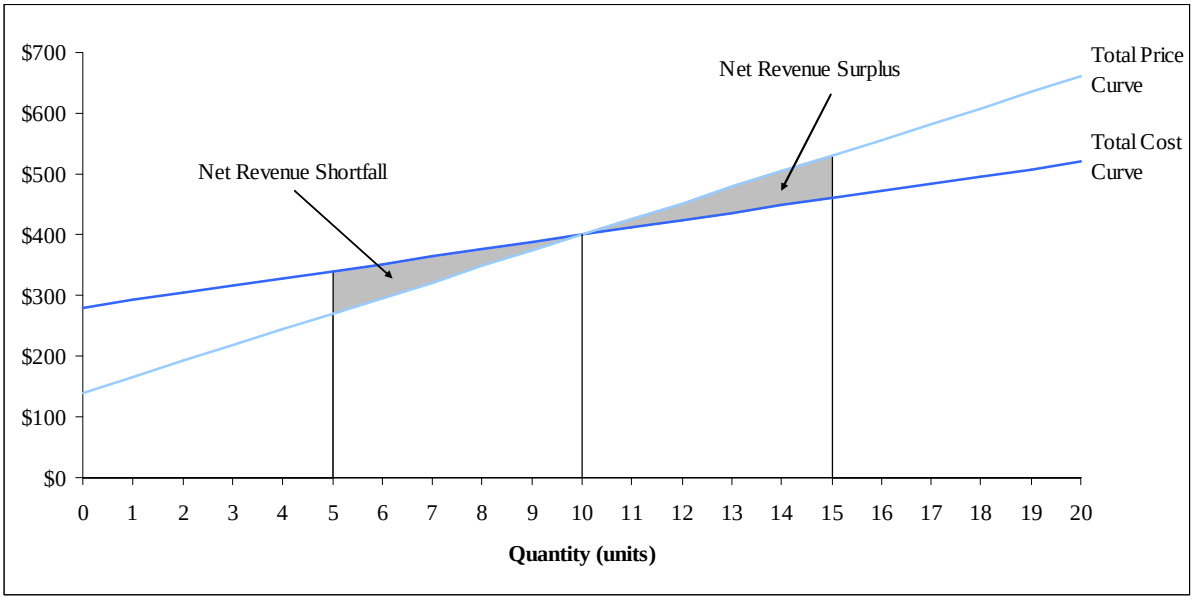

Figure 4.4 demonstrates that with a pricing structure that recovers a higher proportion of revenues from variable charges than it costs, it will have an incentive to sell more units of output in order to achieve higher revenues. However, in SunWater's case it is unable to increase output within the period since it is largely dependent on rainfall. As a result, if demand is less than the forecast it has no ability to increase sales in order to cover its costs. This lack of revenue certainty is in contrast to a revenue cap where the firm's revenues are unrelated to how much output it can sell.

By contrast, if the structure of prices were to match the structure of costs then, under a price cap, there would be no shortfall or surplus revenues if the demand forecast were to differ from the actual demand since any change in costs would be perfectly offset by a corresponding change in revenue.

4.2. Consequences of Revenue and Price Caps

The analysis set out above shows that the critical distinction between revenue and price cap forms of control is the effect on a business' 'net revenues' when actual demand turns out to be different from forecast over the regulatory period. Accordingly, there are varying effects for a business and customers depending on the application of either a revenue or price cap.

4.2.1. Revenue cap

Under a revenue cap, the service provider has a high degree of assurance as to the total quantum of revenue it will receive. However, the consequence of revenues being fixed under all demand outcomes is that the service provider's profit or operating surplus (ie, revenues net of all costs) will vary inversely with output.

Providing that at least some of its costs vary with output, a revenue cap therefore implies that a service provider will experience:

- increased operating surplus when actual demand is less than the forecast on which its revenue allowance has been set; and
- decreased operating surplus when actual demand is greater than the forecast on which its revenue allowance has been set.

It follows that the degree of risk to a business (ie, the extent to which its operating surplus varies – inversely – with demand) under a revenue cap is fundamentally affected by the extent to which its costs vary with output.

If all costs are fixed, irrespective of demand or output, an appropriately defined total revenue cap will always result in a business receiving the appropriate revenue. Of course, in practice, it is almost never the case that costs are completely invariant to output, and so revenue caps do impose a degree of 'demand risk' on the service provider. This is because, if actual demand exceeds the forecast level, the costs of meeting that demand are unmet due to the revenue cap, assuming there is no cost-based price adjustment within a regulatory price path period or unders- and overs-adjustment mechanism.

From the perspective of customers, a revenue cap with in-period price adjustments is likely to mean that unit prices vary from year to year in order to keep revenues stable in the face of variable output or demand. However, this effect only arises where the *structure of prices* involves a relatively *high variable component*. If the structure of tariffs is such that the amount customers pay remains the same no matter what their demand or usage (ie, the tariff is 100 per cent fixed) then a revenue cap has no consequences for the variability in the total annual charges faced by customers.

However, if the structure of tariffs involves a significant variable element, then as demand varies the unit price presented to customers must also change (either up or down, inversely with demand) in order to maintain the revenue target.

An important consequence is that revenue caps may therefore give rise to:

- a disincentive for service providers to respond to or encourage the serving of increased demand even thought this may be efficient – because this gives rise to additional costs that a firm is not able to recover from customers;
- a positive incentive for service providers to discourage customer demand (alternatively, to engage in 'demand management') since reduced demand gives rise to financial benefits;
- potentially high price variability.

The extent to which such incentives or disincentives are material also depends on other arrangements that may exist for encouraging or discouraging consumer demand such as a service incentive scheme, or demand management program. However, the most important influence is the extent to which the costs of supply are fixed or there are adjustment mechanisms in place and so the consequences of variable demand are more or less muted.

4.2.2. Price cap

Under a price cap, the service provider's revenues are determined by the product of its tariff structures and the quantity demanded under each element of that tariff structure. Generally,

under a price cap there is no regulatory constraint on the total revenue that a firm can generate by means of additional sales. In practice, however, SunWater's maximum revenue is constrained since it cannot sell more than 100% of the WAEs.[20]

Whenever customers are charged a two part fixed and variable tariff, a component of revenues will be subject to demand variations. If a service provider's tariff structure does not align perfectly with its cost structure the service provider's net revenues will vary with output.

This variation will be positive where the variable component of tariffs exceeds the variable component of costs, and negative in the less likely circumstance where the variable component of tariffs is less than the variable component of costs.

Providing that the variable charge is greater than the variable costs, a price cap therefore implies that a service provider will experience:

- increased net revenues when actual demand is greater than the forecast on which its price cap has been set; and
- decreased net revenues when actual demand is less than the forecast on which its price cap has been set.

It follows that the degree of risk to a business under a price cap is affected by the extent that fixed costs are to be recovered through variable charges. If the variable component of charges is set so as to reflect the degree of variability in costs, a price cap will always result in a business receiving the appropriate revenue. However, if there is significant misalignment between tariffs and costs (and for reasons of an outside constraint, this cannot be addressed) then, in circumstances where demand is not on track to meet its costs, a business operating under a price cap may have a greater incentive to reduce costs (in order to ameliorate the losses that it would otherwise incur) compared with a revenue cap.

From the perspective of a customer, under a price cap, tariffs are stable throughout the regulatory period irrespective of actual demand. In addition, the service provider has an incentive to meet that increased demand, while if demand falls short of that forecast, the service provider's revenue reduces, in line with its tariff structure (which it has an incentive to bring into line with its cost structure).

Therefore, an important consequence of price caps is that:

- service providers have an incentive to structure their tariffs in accordance with their cost structure, when permissible; and
- service providers have an incentive to meet increased customer demand since this gives rise to additional revenues to cover the increased costs, assuming the service provider has acted on the tariff structure incentive referred to above.

However, there are various ways to address these issues under each of price and revenue caps if closer alignment to costs with tariffs is not feasible.

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[20] Under some circumstances SunWater is able to deliver greater than 100% of the announced allocation to customers when channel water harvesting takes place.

4.3. Options to Address Price and Revenue Variability

Given the analysis above, it can be seen that two sources of volatility arise in the application of both revenue and price caps, ie:

- potential price variations under revenue caps; and
- potential revenue variations under price caps.

The choice of price control therefore turns on the balance between the dual objectives of price stability and revenue adequacy when demand is uncertain. Price stability is beneficial in it allows irrigation customers to plan their crop type and future investments with some degree of certainty and it avoids potentially disruptive and distortionary price changes within a year. On the other hand, revenue adequacy is essential for the ongoing viability of the operator, SunWater. Mechanisms to address each of these sources of variations are discussed in turn below.

4.3.1. Measures to address price variability under a revenue cap

Under a revenue cap there are a number of primary ways to limit the impact of price changes on customers:

- limiting price changes to a particular frequency, eg, annually;
- limiting the allowed change in price within a given time period, eg, +/-10%;
- deadbands; and/or
- limiting adjustment to either a particular tariff component or parameter (eg, Part A or Part B for SunWater).

Each of these constraints if imposed would limit SunWater's ability to recover its full revenue requirements within the period. Whether or not SunWater should bear the risk of water demand volatility depends on SunWater's capacity to manage that risk, relative to that of its WSS customers. In the irrigation sector, SunWater's customers, rather than SunWater, are responsible for managing their supply-demand balance and have greater means of altering consumption compared to SunWater. In this case, it may not be appropriate for SunWater to bear greater demand risk than its customers.

Frequency of adjustment

In broad terms, there are three options for the timing of adjusting prices. These are:

- within a year;
- at the commencement of a new water year; or
- at the commencement of a new regulatory period.

Generally, it is expected that the more frequent the adjustment is made, the smaller the required size of the adjustment. However, water demand can vary substantially over the regulatory period, and so ongoing adjustments may result in unnecessary changes since demand changes may dramatically reverse.

A long period between adjustments results in greater revenue uncertainty for SunWater, although this can be addressed with the use of finance charges. More frequent adjustments will largely ameliorate the cost and/or need for a finance charge as any under or over recovery is quickly adjusted.

It would be expected that the more frequently an adjustment can take place, the less time is needed to balance revenues and costs. For example, under the current SunWater arrangements where an adjustment takes place at the commencement of a new price path, the adjustment for under/over recovery takes place over the entire next price path. Whereas, if prices were adjusted more frequently, the under/over recovery can be rebalanced within a shorter period. However, more frequent adjustments entail greater price volatility which can be disruptive and distortionary for water users.

Size of price change

To ensure price stability, a constraint can be placed on the size of the adjustment (eg +/-10%). Without this constraint, an extended period of low usage either due to low availability or low usage due to rainfall could result in perversely high prices when demand is low.

Deadbands

A deadband or threshold can be put in place that specifies how large the under/over recovery should be before an adjustment to prices are made. Specifically, these can provide for a certain proportion of variation to be borne by SunWater (eg, +/-5%) before an adjustment is made. A large deadband will mean that SunWater may need to carry a revenue deficit for a long period before either demand fluctuates in the other direction, or the deadband is reached.

Tariff component

The current SunWater revenue cap adjusts the Part A charge to account for any net revenue surplus or deficit. The benefits of this approach are that the price signal is not altered and that the revenue surplus or deficit will be recovered over the period, net of any further variations in demand. In time of low water availability, prices would need to be adjusted upwards. The benefit of an adjustment to the Part B charge is that customers will only be charged the extra amount when they use water and reduce the burden in times of low water availability.

Conclusion

These mechanisms should be considered as a suite of potential constraints rather than each in isolation as they can be used individually but work well in combination. By limiting price changes to particular frequencies customers are accorded greater stability than by allowing prices to change at any time the firm believes necessary. In addition, a quantity limit provides greater price certainty to customers regarding the amount that prices can change within the period or at each defined interval.

Given the volatility of water demand there is merit in providing adjustments less frequently so that variations in demand and prices can average out over the period. However, any constraint that limits SunWater's capacity to recover its costs should involve an analysis of the impact on SunWater's viability and its investment incentives.

4.3.2. Measures to address revenue variability under a price cap

Under a price cap, there are likely to be revenue variations when actual demand does not equal forecast demand. This can be managed, if appropriate, through either a:

- cost pass-through; or
- review trigger.

A cost pass-through arrangement may be allowed by a regulator to require customers to pay for substantial exogenous changes in expected costs. Cost pass-through is generally resolved by deciding:

- whether the change in costs could have been anticipated and thus managed or avoided by the service provider;
- the extent to which allowing recovery of unanticipated costs would reduce incentives to pursue efficiency; and
- whether the impact of the change in costs on either the service provider or the customer is material.

A review trigger allows the regulator to review the price cap and adjust if necessary if there is, or there is expected to be, a sustained variation in revenue.

4.4. Incentive Mechanisms

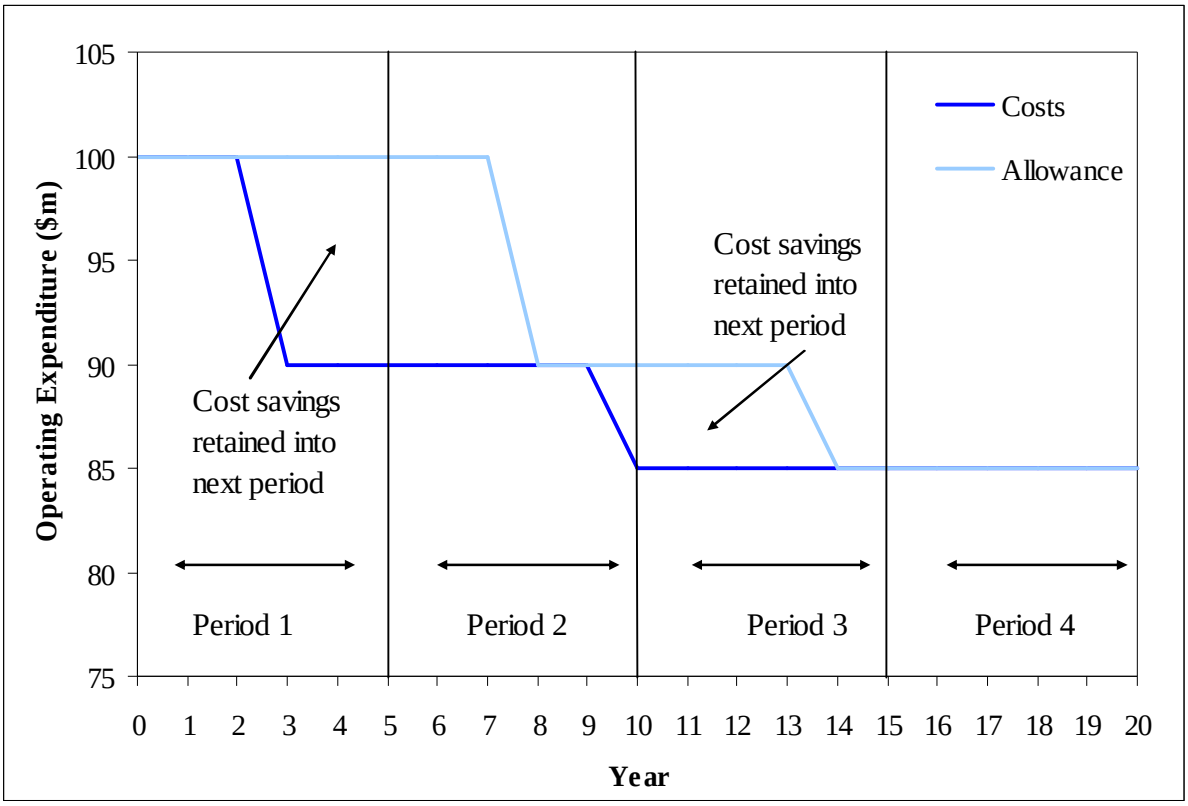
The aim of incentive regulation is to establish arrangements that provide incentives for firms to reduce costs, innovate and undertake efficient investments. One aspect of these arrangements is the extent to which profits are allowed to be retained and losses absorbed by the regulated entity. Incentives to pursue cost efficiencies, associated with carry-over mechanisms, can exist equally under price or revenue caps since the focus is on cost differences between periods, rather than demand differences.

However, one challenge arising under incentive regulation is that the incentives to reduce costs within a regulatory period may not be uniform for each year. The strongest incentive to reduce costs under a standard incentive mechanism is typically in the first year of a regulatory period, so that cost savings can then be retained for the remainder of the period. The closer a business becomes to the end of the period, the less likely it is to put in place any efficiency enhancing measures, since any reductions in cost will be applied in the form of reduced prices for the next regulatory period. Further, because the observed costs of a regulated firm are generally an important input to setting future prices, this reinforces the incentive to defer cost savings until the following period.

Recognition of these incentives has lead to the development of 'efficiency carry-over' schemes that allow the regulated firm to retain efficiency savings for a fixed period of time ideally linked to the year of the regulatory period when those savings occurred. For example, if the regulatory period is five years, a carry-over scheme could allow the firm to keep any cost savings for a period of five years, linked to the year when those savings were achieved.

That means that there would be no strong incentive[21] to pursue cost savings at the beginning of the period compared to the end of the period. This is illustrated in the following figure.

Figure 4.5: Example of Efficiency Carry-Over Mechanism



This shows that efficiency carry-over schemes can be applied to firms subject to either a revenue or price cap, since the carry-over amount is determined by reference to differences between forecast and actual costs, rather than demand (although the measurement of efficiency savings may take into account the effect of actual demand on actual costs). It is more common for carry-over regimes to apply strictly to operating expenditures due to the difficulties in applying them to capital expenditures, where deferrals and cancellations may be caused by changed circumstances.

In the case of SunWater, efficiency incentives are also relevant for its motivation to achieve operational water efficiency savings. It has already been noted that SunWater holds WAEs to account for distribution losses, as specified in the ROP, and that these can be converted to tradeable permits if efficiency savings have been implemented. In order to ensure that the trading revenue incentive is preserved, the form of price control would need to exclude revenues from converted distribution loss WAE sales. However, we understand that the administration associated with converting the permits diminishes the role of trading revenues as motivation for undertaking water efficiency measures.

[21] There could still be an incentive in net present value terms depending on the discount rate that applies.

5. Forms of Price Control Assessment

In this section we derive a set of criteria to assess the alternative forms of price control based on economic efficiency considerations. Next, we apply these criteria in our analysis of SunWater. Accordingly, we also discuss the implications likely to arise from any transitions from the current arrangements as well as an assessment of the current framework given the assessment criteria.

5.1. Considerations for Choosing the Form of Price Control

Given the objectives of economic regulation, a key consideration for assessing the most appropriate form of price control for SunWater to achieve greater economic efficiency is the ability for the structure of tariffs to be brought into line with the structure of costs. By doing so, appropriate signals can be provided to consumers regarding consumption in conjunction with adequately meeting the service provider's costs of providing the service.

With two part tariffs, the analysis detailed in the preceding chapter showed that when the structure of tariffs does not align with the structure of costs there is a potential for the service provider not to recover its costs due to demand varying from the forecast for which tariffs were derived.

A price cap establishes a strong incentive for a business to reform its tariff structure to align with the structure of costs. This is because bringing the structure of prices and costs into line reduces the risk of demand variability to the business and also to its customers. However, there may be constraints that apply to a firm acting in its own interest to bring the structure of its tariffs into line with its costs, such as:

- regulatory or other constraints, reflecting concern that customers should have 'a degree of control over their bill' and/or that low users should not contribute as much to fixed costs as higher users; and/or
- costs are generally more variable over longer periods of time, and an estimate of the long run variability in costs may extend beyond the length of the regulatory period, ie, it may not be sufficient to rely on a business to set tariffs or be able to reflect the effect of this long run cost variability within any given regulatory period, although some restrictions may be placed on the tariff structure with longer term objectives in mind.

These possibilities give rise to within period risks of demand variability that a business is not able to address or capture. The nature of this risk is likely to be that its tariff structure does not align with its cost structure. These circumstances mean that the criteria for the price cap versus revenue cap decision extends beyond the principal consideration of incentives to align tariffs with the structure of costs.

Without alignment between tariff and cost structure, there are different incentives under alternative price controls to respond to consumer demand. In addition, providing incentives to the provider to minimise losses on the network is also relevant. These are important in ensuring that water is allocated to its most efficient use and consumers are provided a service if they are willing to pay the appropriate price. However, alternative price controls allocate

demand forecast risk to different parties, which imposes costs. It is therefore also relevant to consider the party's ability to manage demand forecast risk.

Where it is not as important to provide incentives to encourage structural alignment of tariffs or signal the efficient use of the network, then the more important objective is to ensure that revenue outcomes are as close as practicable to the forecast revenue requirement. This effectively involves giving more weight to the objective of the service provider achieving adequate revenues to cover its costs.

Indeed, the Authority is required to consider revenue adequacy explicitly in recommending prices for SunWater, as well as in other determinations. However, since doing so may lead to price volatility, it is also necessary to consider price stability for customers, which is also a consideration for the Authority in making determinations.

In summary, the following criteria will be utilised to assess the form of price control most appropriate for SunWater:

- incentives for efficient tariffs;
- incentives for efficient water use, storage and distribution;
- efficient allocation of demand risk;
- adequacy of revenue outcomes; and
- stability of pricing outcomes.

5.2. Price Caps vs Revenue Caps

5.2.1. Incentives for efficient tariffs

For the 2000-06 pricing period SunWater was subject to a government price cap with two part tariffs split 70 to 30 per cent fixed to variable. For the 2006-11 price path, SunWater was able to negotiate its tariff structure, which did not result in a tariff structure significantly different to that which previously prevailed. This outcome may be consistent with the desire to reach agreement and/or a broader government policy to assist rural development, which would act as a constraint for SunWater to implement a more efficient tariff structure.

Indeed, in SunWater's case considerations included accounting for customers that would be subject to high fixed costs during periods of low or no water availability in which they would have reduced income available to pay their bills. The introduction of a drought tariff illustrates this concern. During consultation for the 2006-11 price path, customers expressed a strong desire for the Part A charge to be minimised, particularly when water availability is low. However, if the variable component is set equal to the long run marginal cost (LRMC) of supply so as to encourage longer term efficient price signals, this suggests the fixed component should increase, thereby also assisting to achieve revenue adequacy.

However, if SunWater is facing informal or other constraints, there may be limited opportunities for tariff structures to change regardless of the incentives. If SunWater's tariff structure and cost structure are not able to be brought into line, then it may be more important to provide greater revenue certainty through alternative mechanisms.

5.2.2. Incentives for efficient water use, storage and distribution

If within-period fixed costs are high, and the tariff structure is weighted more towards a variable component and cannot be brought into line with costs, then a price cap will give rise to a financial incentive to encourage greater sales (due to a net revenue benefit of higher than forecast demand). However, if variable charges are artificially high since they are recovering more than marginal costs, that fact is also likely to be discouraging consumption. In practice, though, there are very limited options for SunWater to encourage or discourage sales as the amount of water available for sale is determined by the ROP.

However, SunWater potentially has the ability to affect water use through its management of losses. In the storage and delivery of water, there will be some water losses incurred arising from:

- *storage* - due to the evaporation of water from the surface of a storage and seepage losses from the base of the storage and dam wall;
- *transmission* - water which is taken up by the stream during releases in the watercourse; and
- *distribution* - occurs when water is released or diverted for distribution through a channel distribution system.

Storage and transmission losses are taken into account for the purposes of determining the availability of water prior to release (ie, announced allocations). Distribution losses are carried by SunWater through holding special purpose WAEs.

There is little scope for SunWater to reduce losses. However, we understand that there is a view that opportunities exist to reduce distribution losses, such as channel lining or improved metering, and that joint investments have been made with customers for channel improvements on the basis of the savings being shared.

If SunWater can reduce distribution losses through greater water distribution efficiency, it can apply to DERM to convert the associated WAEs into tradeable permits. As stated in the previous chapter (section 4.4) the form of price control chosen will have an effect on SunWater's incentives to invest in water efficiency programs providing that the potential trading revenues from converted permits acts as motivation for undertaking such programs. Under a revenue cap, the revenue from trading converted WAEs will contribute to SunWater meeting its revenue cap which would reduce the incentive to undertake these efficiency methods as the total revenue, from all SunWater activities, would not increase. To ameliorate this disincentive, the revenue cap could be designed to exclude revenues when they result from water efficiency improvements. There would be no effect under a price cap.

5.2.3. Efficient allocation of risk

Demand risk

If price caps in combination with restraints on reforms to tariff structure provide an incentive to increase sales, the ability to act on this incentive may itself provide a means of ameliorating the risk of demand forecast uncertainty. In other words, if the demand forecast

is wrong, but the firm has means to spur greater sales to recover otherwise forgone revenue, then it might be argued that a price cap acts to reduce the total cost of demand forecast risk.

Importantly though, such outcomes depend on how realistic it is to expect regulated firms to be able to influence sales, other than by their decisions as to price structure. SunWater appears to have little ability to increase output since its options are limited to capital upgrades and more efficient water management. SunWater's sales are largely dependent on rainfall and the actions of its customers during the regulatory period.

In contrast, SunWater's customers appear to have relatively greater scope to manage demand by holding excess entitlements, using temporary trade markets or sourcing additional supplies (eg, groundwater). Customers also have some ability to manage risk by altering crop type and quantity. Alternatively some irrigators have capacity to diversify into several crops types including some that require little water. However, the availability and applicability of these options are likely to differ between schemes. Compared to SunWater, it may therefore be more appropriate for SunWater's customers to bear more demand forecast risk in the form of a revenue cap.

Supply risk

If SunWater anticipates that greater demand may be met by future customers and there is the hydrological capacity available, SunWater may invest in scheme expansion. If the demand associated with this investment is underestimated then adequate infrastructure capacity will not be available and customers may seek alternative sources of supply.

Where demand is overestimated, SunWater may be left with substantial excess capacity until the forecast demand materialises. Given that SunWater has a comparative advantage in estimating new demand, this risk, which could be characterised as supply risk, should be borne by SunWater. However, the opportunity for significant new infrastructure is thought to be minimal, so that the choice of a revenue or price cap for this aspect has little effect

5.2.4. Adequacy of revenue outcomes

This criterion, or objective, is relevant where there is no intrinsic desire or ability to encourage or discourage greater sales, and so the more important objective is to ensure that revenue outcomes are as close as practicable to the forecast revenue requirement. Revenue adequacy is particularly important for SunWater, which has a history of lower bound pricing. Since lower bound pricing does not provide for a specific return on assets, there is little margin to continue operations if revenues are less than costs for a sustained period.

While we understand that the Authority has not formed a view on asset values, the Ministerial direction requires that assets be written down to reflect capacity to pay, if required. In the event that more formal regulation of price were to cause asset values to be written down substantially and so there was no prospect of prices including much if any return on capital element, then the requirement for revenue adequacy becomes more prominent.

Since SunWater is government owned and provides an essential service it may be expected to continue operations despite loss-making operating conditions. However, this would imply a greater or continuing reliance on government transfers, which diminishes the role of providing price signals to customers.

In circumstances where there is no intrinsic desire or ability to encourage or discourage greater sales, revenue caps are superior at delivering revenue stability and thereby reducing the risks associated with demand forecast errors. But this comes at the disadvantage of no reward (penalty) for additional costs incurred (saved) in making additional sales (not meeting demand forecast). The strength of this disadvantage depends on the short term variability of costs. In other words, the lower the short term variability of costs the less is the disadvantage imposed by revenue caps through their compromising of incentives to respond to changes demand. This appears relevant in the case of SunWater, which is unable to respond to incentives to increase or decrease output and so the incentives that might otherwise arise from the variability of its short term costs are less applicable.

5.2.5. Stability of pricing outcomes

This criterion, or objective, refers to the desirability of stability with respect to pricing outcomes. Cost and demand variability can result in price changes for customers that vary considerably when comparing a revenue cap and a price cap. However, the extent of the variation is determined by the constraints that are in place.

Under a revenue cap:

- the unit charge faced by each customer can vary, depending on the constraints, when actual demand is different to the forecast;
- the amount an individual customer pays goes up and down with that individual customer's consumption; but
- the total amount that all customers pay is relatively stable over time, since demand risk lies with the customers, however, the amount paid by individual customers will be related to their consumption.

In contrast, since price caps restrict price changes within the period it means that:

- the unit charge faced by each customer is relatively stable, depending on the constraints in place;
- the total amount customers pay goes up and down with consumption (as given by the variable component of tariffs); and
- the demand risk lies with the service provider.

The degree of price variability will be determined by the variability in demand and the extent that the variable component of prices is recovering variable costs. In addition, a revenue cap can be modified to avoid changes in prices within the regulatory period in response to deviations in demand from the forecast.

The revenue cap that some of SunWater's customers have currently adopted carries over any surplus or shortfall net revenues into the next price path to be applied to future prices. This means that during the price path customers with revenue caps are no different to customers with price caps. It is only in the following period that revenue cap customers will be affected by either higher or lower starting prices as a result of SunWater under- or over-recovering revenues as a result of actual demand being different to the forecast.

5.2.6. Summary

The table below sets out the assessment criteria with the relevant characteristics of SunWater and so, the implied form of price control.

Table 5.1: Summary of Form of Price Control Assessment

Criterion	SunWater characteristic	Implied Form of Price control
Incentives for Efficient Tariffs	SunWater had the opportunity during the current regulatory period to increase the fixed component of its tariffs, but did not apparently take this up. This suggests that it faces informal constraints on bringing its tariff structure into line with costs.	If unable to change tariff structure – Revenue Cap If tariff structure can be brought more into alignment with cost structure – Price Cap
Incentives for efficient water use, storage and distribution	Limited options for any business to influence output. SunWater is limited in scope to respond to potential sales opportunities because water allocations are fixed and so growth opportunities are limited. SunWater is able to apply to DERM to convert WAEs held for distribution losses into tradeable permits if water efficiency measures are undertaken.	Price Cap Revenue cap if revenue from water trading sales not included in the cap. There is little scope to influence output under either approach.
Efficient allocation of demand risk	Customers can manage their demand through holding excess entitlements and water trading. SunWater has limited ability to manage supply. Customers are therefore better placed to manage demand risks and SunWater is best placed to manage supply risk.	Revenue Cap for existing demand Price cap for new demand and planning risk, but this is limited in scope.
Adequacy of revenue outcomes	Given SunWater's current tariff structure and the inherent difficulty with forecasting demand, SunWater has and will continue to experience net revenue shortfalls under current arrangements.	Revenue Cap Price cap if tariff structure is brought into line with cost structure
Stability of pricing outcomes	SunWater's customers desire price stability in order to make production decisions.	Price Cap Revenue Cap with smoothed price changes (eg, current cumulative approach)

5.3. Considerations for any Transition

This section explains the broad implications for managing the transition of WSSs to either a revenue or price cap regime at the commencement of the 2011-16 price path.

5.3.1. Transitions to a revenue cap

Of the 22 Water Supply Schemes operated by SunWater 19 elected to be subject to a price cap regime for the 2006-11 price path. There are potentially two effects of a transition from a price cap to a revenue cap, ie:

- the introduction of price variability; and
- a change in the total amount paid by an individual customer.

Currently, prices are stable during the price path period for customers under a price cap and for customers under a revenue cap because the adjustment to prices for overs and unders arising from a revenue cap takes place at the commencement of the next price path period. However, with an introduction of a revenue cap that allows intra-period price adjustments, all customers would be affected by potentially larger price variations, including those currently subject to revenue caps.

Customers currently subject to price caps may experience a difference in their total bills when moved to a revenue cap. Under a revenue cap, where the total customer demand is different from the forecast demand, prices will change (either within period or at the commencement of the next period) to account for the difference between the revenue cap and revenues received as a result of demand. The change in the customer's total bill as a result of the transition will depend on the outcome of demand compared to the forecast demand.

Under a revenue cap if actual demand is less than forecast demand then SunWater accrues a net revenue surplus and customers pay more than they would under a price cap because prices increase to meet the revenue cap (either within the period or during the following period). Alternatively, if actual demand is greater than forecast demand then SunWater incurs a revenue deficit and irrigation prices are lower than under a price cap because prices decrease over time to meet the revenue cap.

5.3.2. Transitions to a price cap

Under a price cap, the maximum price that the business can charge per unit is fixed. The price cap mechanism does not limit the amount of revenue received by SunWater but the hydrology constraints mean that SunWater cannot sell more than 100% of WAEs. The potential effects of a transition from a revenue cap to a price cap depend on whether actual usage is higher or lower than forecast usage. Under a price cap the business retains any net revenue surplus if demand is greater than the forecast and so customers have paid more than the costs required to meet that level of demand. If actual demand is less than forecast demand then customers have lower total bills and the business incurs a net revenue deficit.

Consequently, a price cap form of control is 'advantageous' to customers in circumstances where actual demand is lower than forecast demand, since the variable charge is less than it would have been had the forecast of demand reflected the outturn level. Accordingly, in

these circumstances customers benefit at the cost of the provider, whereas the converse applies if demand is higher than the forecast. Therefore, customers that are subject to revenue caps and achieve demand greater than the forecast will experience price reductions that would not occur under a price cap.

There are currently three schemes that are subject to revenue caps. In managing the transition to a price cap there will undoubtedly be a balance (either negative or positive) to carry-over. Any carry-over can either be treated as part of the current price path and so applied to the next period's prices regardless of the price control determined, or retained by SunWater. However, if the balance is retained, revenue cap customers (SunWater) will potentially require reimbursement for the finance costs they incurred (or received) throughout the period to make them equivalent to price cap customers. In that case, and since there are only three schemes, it may be simplest to account for the balance in calculating the next period's prices in accordance with their revenue cap terms.

5.3.3. Effect of any transition

Under both of the scenarios described above, there are potential effects on customers' bills. These can be managed by employing constraints or adjustment mechanisms, as described in section 4.3, in order to phase in the transition. Also, as the transition to upper bound pricing occurs across all schemes, provided the gaps are not increased between price and cost structures, SunWater will be in a better position to manage revenue risk and the focus on the form of price control becomes less imperative.

5.4. Effect of Customer Choice of Control

In the circumstances where the tariff structure does not reflect the cost structure, either SunWater or irrigators will benefit when actual demand does not reflect forecast demand. The party that benefits depends on the form of price control and whether forecast demand understates or overstates actual demand.

It is expected that irrigators will be able to forecast their demand with greater accuracy than SunWater. Assuming so and if irrigators are able to decide which form of price control to apply, they will choose the form of price control that most favours them. The benefits that accrue to irrigators come at the cost of lower net revenues for SunWater. SunWater's final report highlights this incentive stating that "[the customer] believed the scheme could achieve an average irrigation water use of greater than [the forecast] over the next five years and therefore adopted a revenue cap form of price control".[22]

Hence, when irrigators select the form of price control, it would be expected that SunWater's net revenues would be less and the irrigator's welfare would improve. This is because customers will choose the form that most benefits them. If they can convincingly overstate their demand forecast they will choose a price cap (so tariffs are lower than they would otherwise be with the accurate forecast) and if they can convincingly understate their demand they will choose a revenue cap in order to be reimbursed through lower tariffs afterward.

[22] SunWater, SunWater Irrigation Price Paths 2006/07 – 2010/11: Final Report, September 2006, pg24.

Given these known incentives, irrigators can be expected to reveal their belief regarding the accuracy of their forecast; however, the variability of weather conditions and water availability in the rural sector can result in demand significantly different than even the best forecasts. This is evident given that revenue cap customers are currently not consistently above the forecast. Accordingly, it would be expected that should customers be able to choose again they will most likely all aim to overstate demand and choose a price cap, which has the effect of placing all significant demand risks with SunWater.

6. Case Studies

This section sets out the approach to price control utilised in selected Australian jurisdictions.

6.1. New South Wales

In New South Wales, State Water provides bulk water services to rural areas across the state excluding areas served by the Sydney Catchment Authority, Sydney Water, Hunter Water and other water supply authorities. State Water is a state-owned corporation established in 2004 which was previously part of the Department of Energy, Utilities and Sustainability and prior to that part of the Department of Land and Conservation.

The prices State Water charges for its bulk water services are determined by the Independent Pricing and Regulatory Tribunal (IPART). Although IPART sets maximum prices (price cap) it has stated in its Final Determination that it will allow a revenue volatility allowance to compensate State Water for deviations in demand from the forecast. Over the preceding period State Water significantly under recovered its forecast revenue due to severe drought. IPART considered that State Water "will continue to face volatile revenue streams over the 2010 determination period due to varying weather conditions".[23]

IPART also adopted a shorter term focused demand forecasting strategy to improve the accuracy, however, it recognised that there is an inherent difficulty in forecasting variable climatic conditions. IPART also considered that revenue shortfalls can occur before windfalls which require State Water to finance that shortfall from year to year. Furthermore, it noted that under the NWI principles, water access entitlement holders are responsible for any reduction in water availability due to long-term changes in climate and drought.

Indeed, given the charging structure of State Water, which recovers a majority of costs through variable prices, IPART considered it "appropriate for State Water to recover the costs of bearing this risk from its customers".[24] Therefore an allowance was included in State Water's cash flows to manage this risk in the form of a revenue volatility allowance. The allowance is calculated as the WACC multiplied by a measure of volatility experienced over a twenty year period.[25] This revenue is to be recovered from general security entitlement holders as their revenue is less stable than other revenue streams.

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[23] IPART, *Draft Decision: Review of Bulk Water Charges for State Water Corporation for 1 July 2010 to 30 June 2014*, March 2010, pg44.

[24] IPART, *Final Decision: Review of Bulk Water Charges for State Water Corporation for 1 July 2010 to 30 June 2014*, June 2010, pg56.

[25] Extraction Volatility = $\frac{1}{20}\sum_{i=1}^{20}\left|m - X_i\right|$, where X_i terms are the last 20 years of actual extractions and m represents the 20 year moving average for extractions. IPART, *Final Decision: Review of Bulk Water Charges for State Water Corporation for 1 July 2010 to 30 June 2014*, June 2010, pg57.

In the previous review IPART denied State Water's request to have a revenue shortfall adjustment mechanism to address the same problem.[26]

6.2. Victoria

The Essential Services Commission (ESC) became the regulator of all water businesses in the state on 1 January 2004. Its first review of rural prices was completed in June 2006 for a two year period commencing on 1 July 2006 for the following businesses:

- First Mildura Irrigation Trust;
- Lower Murray Water;
- Goulburn-Murray Water;
- Southern Rural Water; and
- GWMWater.

Each of these businesses is state-owned and provides a range of services, some also providing urban reticulation in addition to rural bulk water.

For their rural bulk services the businesses proposed a tariff basket form of price control although the ESC determined that a revenue cap form of control was more appropriate. It considered that while a tariff basket would provide flexibility it would also be difficult to administer, especially where new tariffs were introduced. In addition, the ESC noted that potential revenue volatility in the rural sector was high and so there were benefits to ensuring that a business "did not unduly gain or suffer as a result of actual sales being materially different from forecasts."[27]

The first year prices were determined by the ESC with the second year's prices proposed by the businesses to be consistent with the revenue cap but reflect actual revenue earned from the first year. Any amount of revenue that was above or below the forecast (due to actual demand) would be taken into account at the following determination.

The ESC stated that it believed this approach:[28]

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[26] IPART, Bulk Water Prices for State Water Corporation and Water Administration Ministerial Corporation from 1 October 2006 to 30 June 2010, September 2006,pg24.

[27] ESC, *Rural and Urban Water Businesses' Water Plans 2006-07 to 2007-08: Final Decision (FMIT)*, June 2006, pg21

[28] Ibid, pp21-22.

- provides strong incentives to minimise costs but not at the expense of worse services standards as businesses are unable to pass on higher than forecast expenditure to customers;
- allows for variability in revenue to be taken into consideration when setting tariffs, thus providing businesses with certainty and stability;
- gives customers sufficient (although not total) certainty regarding prices;
- eliminates the need for complex adjustments during the regulatory period;
- allows for the introductions of new tariffs; and
- acknowledges that actual quantities may be different from those forecast and that neither businesses nor customers should be unduly penalised as a consequence.

Each of the businesses agreed with the revenue cap form of price control, which was also carried into the subsequent regulatory period (2008-2013).[29] The revenue cap only applies to the rural services provided by these businesses; a hybrid price cap approach is utilised for the urban services.

6.3. Murray-Darling Basin

The Australian Competition and Consumer Commission (ACCC) has recently become the regulator of water resources in the Murray-Darling Basin. Under the Water Act 2007 the ACCC is responsible for advising the Minister for Climate Change and Water on water market and charge rules, monitoring and enforcing those rules and providing advice to the Murray-Darling Basin Authority on water trading rules for inclusion in the Basin Plan.

The ACCC has provided its draft advice on infrastructure (bulk water) charges. It has proposed a three tiered approach for the extent of control, being:[30]

- Tier 1: Rules that require operators to publish their schedule of fees and charges and prohibit unfair discriminatory pricing, to apply to all operators.
- Tier 2: Rules that require the relevant operators to undertake certain procedural and publishing requirements in determining their charges. Tier 2 is to apply to large member-owned operators and medium-size non-member owned operators.
- Tier 3: Rules that allow the ACCC to approve or determine regulated water charges for the relevant operators. Tier 3 is to apply to large non-member owned operators.

For its role in Tier 3 entities, the ACCC considered that if charges are set for a period of time the provider, as well as customers, face demand risks. However, it stated that although a revenue path could be restricted, rather than prices, which would provide greater revenue certainty to the provider, this could allow prices to fluctuate substantially which is generally not desired by regulators. The ACCC therefore recommended that in addition to the charge setting process that will occur at the beginning of a regulatory period there would be annual

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[29] ESC, *2008 Water Price Review, Regional and Rural Businesses' Water Plans 2008-2013, Melbourne Water's Drainage and Waterways Water Plan 2008-2013 – Final Decision*, June 2008, pg172.

[30] ACCC, *Water Infrastructure Charge Rules: Draft Advice*, April 2009, pg11.

approvals or determinations throughout the period to allow for charges to be set using more recent demand forecasts.[31]

In making its annual decisions on charges the ACCC would only need to consider whether the proposed charges conform to the maximum revenue path and that the demand variation was reasonable.

[31] ACCC, *Water Infrastructure Charge Rules: Draft Advice*, April 2009, pp70-71.

7. Summary

Water demand is inherently difficult to forecast, and this challenge is particularly pronounced in the rural sector and so for SunWater. Yet, water demand is a key determinant for calculating prices. Under a price cap, if the structure of tariffs does not align with the structure of costs a difference in actual demand from the forecast can give rise to substantial variation in revenues. SunWater's tariff structure currently is materially different from its cost structure, and so the unpredictability of demand can be expected to put its revenues at risk under a price cap. For the 2006-11 price path, SunWater offered its customers the option to choose the form of price control for the current price path and most chose a price cap with three schemes opting for a revenue cap.

Throughout this report we have highlighted the critical relationship between the structure of costs and the structure of tariffs. Essentially, the greater the difference between these two structures the greater the emphasis is required on the form of price control. In other words, SunWater can be provided with greater revenue certainty either through increasing fixed charges or through a revenue cap. However, both price caps and revenue caps have a variety of other effects. Accordingly, we have derived a list of criteria for choosing the most appropriate form of price control:

- incentives for efficient tariffs;
- incentives for efficient water use, storage and distribution;
- efficient allocation of demand risk;
- adequacy of revenue outcomes; and
- stability of pricing outcomes.

Importantly, this report shows that the choice between price and revenue caps need not be as stark as is sometimes presented, ie, side constraints and corrective mechanisms can be utilised to smooth the effects under each to benefit those adversely affected by their characteristics (either SunWater or its customers). Indeed, similar mechanisms are utilised by other Australian regulators as they recognise the specific circumstances of the rural water sector. Further, as the transition to upper bound pricing occurs across all schemes, provided the gaps are not increased between price and cost structures, SunWater will be in a better position to manage revenue risk.

Regardless of the form of price control chosen, an analysis of the outcomes of the current price path indicates that SunWater may be bearing more risk than it could be expected to manage compared to its customers. If continued, this may be leading to insufficient revenues depending on the variation between actual and forecast demand in the future. Greater revenue certainty for SunWater can be attained by either aligning the tariff structure with the cost structure under a price cap or through the application of a revenue cap.

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